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ELEPHANT GRASS OR NAPIER'S FODDER.*

(*Pennisetum purpureum—Schum.*)

H. G. Elliott,
Agrostologist.

Introduction.

Elephant grass, as far as can be ascertained, was first introduced into Western Australia in 1916 by Mr. A. Crawford, then Chief Inspector of Rabbits, Department of Agriculture, who obtained a small sample of seed from Rhodesia, Central Africa. The seed was planted in his garden at Claremont and only one germinated. From the resulting plant supplies have been distributed over Western Australia.

Several cuttings were grown by the late Mr. Catton Grasby in 1917 and some idea of the rapidity with which the plant multiplies can be gained from the fact that he distributed over 4,000 cuttings in the spring of 1918 to farmers in various districts of the State.

In the "Agricultural Gazette" of New South Wales for October, 1916, there are some notes on trials of this grass made in the Sydney Botanical Gardens and elsewhere in that State. Mr. E. Breakwell, B.A., Agrostologist, stated that under Sydney conditions, the trial showed that the grass is hardy and palatable, and made good growth in the winter months. Up to the time of writing, seed had not developed, but no difficulty had been found in growing the grass from rooted slips or cuttings. In Rhodesia it has the reputation of being "drought resistant capable of enduring winter conditions and adapted to light soils," and this has been confirmed in New South Wales, but the results were at the time of the report inconclusive.

Description of Plant.

A tall perennial grass with creeping rhizome, culms erect, in tufts of up to 20, six to ten or more feet in height, branched, terete glabrous, smooth excepting the uppermost internode, which is more or less hairy to tomentose in the upper

* Revised from an article of the same name by Messrs. G. K. Baron-Hay and C. A. Gardiner.—Leaflet No. 248.

part. Nodes mostly exserted from the sheaths, all glabrous, or some of them with a ring of stiff long adpressed hairs. Leaf sheaths terete, clasping the stem, striate; ligule a narrow rim bearing a dense fringe of white hairs; blades linear, very long, tapering upwards 1 to 3 feet long, with a strong midrib. Flowers in a dense cylindrical spike from 4 to 12 inches long, usually yellow or tinged with brown, purple or black-purple, composed of deciduous spikelets or bundles of spikelets, each spikelet or bundle surrounded by an involucre of numerous bristles minutely scabrid and slightly plumose towards the base, unequal, 1.2-2 or up to 4 cms. long. Spikelets sessile, or if in bundles of two to four, the lateral pedicelled or lanceolate, more or less acuminate, 5-7 mm. long, glabrous, green or straw-coloured, or tinged with brown or purple towards the tips of the florets, rarely dark purple throughout, hermaphrodite or, if fascicled the lateral male, rarely all neuter or all male. Lower glume rudimentary or suppressed, upper ovate to ovate-lanceolate, acute 0.5-1 mm. long, subhyaline 1-nerved or nerveless. Lower floret male, or more often barren; the glume lanceolate, acute or acuminate, usually as long as the upper floret, more or less distinctly 3-nerved, rarely 1 or 5 or even 7-nerved; palea linear-lanceolate, 2-nerved, shorter than the glume. Upper floret hermaphrodite, or in the lateral spikelets male, flowering

Elephant Grass at Claremont Hospital for the Insane. One month's growth after cutting, 1928.

Photo. G. K. Baron-Hay.

glume lanceolate, acuminate, minutely roughened upwards, usually 5-nerved at least in the upper part; palea narrow linear-lanceolate, slightly shorter than the flowering glume, apex minutely 2-toothed. Lodicules 0. Anthers 2.5-3 mm. long, tips very minutely penicillate. Styles united all along; stigmas very slender, up to 4 mm. long, exserted from the tip of the floret. Grain obovoid-rhomboidal, yellow, smooth and shining, abruptly tapering into the style.

The species is a native of tropical Africa, where it has a very wide range between 10 degrees N. Lat. and 20 degrees S. Lat. The northern limit runs from

Sierra Leone through the great equatorial forest zone to the Cameroons, thence to the Nile, Lake Victoria and British East Africa. The southern limits run through Angola to Katanga, thence across the middle Zambesi to Eastern Rhodesia as far east as Beira. Within this immense area it occurs principally along watercourses and in marshy depressions but occurs also in the well-lighted forest areas. It often forms reed jungles. In the drier savannahs of East Africa it is rarely more than six feet high.

In Western Australia, under drier conditions than in its native habitat, six to eight feet is considered a good growth.

The grass has been under notice in Africa since 1905, and is considered one of the best fodder grasses there, where it has been tested under severe conditions for some years.

Elephant grass was probably introduced into Australia in 1914 by the Department of Agriculture, New South Wales, which obtained a parcel of seed in that year. Only one seed germinated, the resulting plant becoming the origin of the grass in that State.

Fine variety grown by F. Coyle, Peel Estate, on light sandy soil. Note flowering heads at height of 4 to 6 feet.

Photo. G. K. Baron-Hay.

Habits.

Elephant grass (*Pennisetum purpureum*) is a coarse grass when mature, and is characterised by extremely rapid growth under moist and warm conditions. It grows in clumps which stool prolifically, and is thus usually planted in rows from four to six feet between the plants.

Mature leaves, which attain a length of 2-2½ feet are coarse, but, when the plant is grazed or cut, the young shoots, until the plant reaches a height of three feet, are soft, succulent and relished by stock.

There appears to have been several distinct strains evolved, differing in such characters as hairiness of leaf and stem, height at maturity, etc.

Up to about 1930 the common variety grown in this State had large broad leaves and flowers at from seven to eight feet. At the present time a much finer leaved variety is grown, which matures at a height of six feet. This variety grows more rapidly in the summer months.

Climatic Conditions.

Elephant grass is extremely drought resistant, but, being a heat loving plant, thrives best during the summer months. Those districts, therefore, where no summer rains occur, or where moist ground is not available, are not likely to suit it.

The grass prefers a deep, well drained loamy soil, with plenty of moisture, but has shown itself capable of growing on a variety of poorer sandy soils, under dry conditions.

Where irrigation is possible, excellent results have been obtained on the deep coastal sands as at the Claremont Hospital for Insane (see block 1).

This plant also has demonstrated its ability of growing on the jarrah and she-oak hills found in the extreme South-West, typically from Narrikup to Denmark, including Albany. These hills are of a sandy nature, either lying on solid coffee rock (a form of laterite) or studded with "floating" masses of this rock, on which soils very disappointing results have been obtained with the more common and better class pasture grasses and clovers.

Good results have been reported on the lighter soils surrounding swamps on the Peel Estate and at Bulisbrook, which retain some moisture during the summer months.

Elephant Grass on sandy loam at Redmond, near Albany, grown by Mr. J. H. McGoff.

Photo. G. K. Baron-Hay.

It was stated earlier that this grass would not be very suitable for the Wheat Belt areas—but it is now evident that it is not only useful for the Coastal districts, but also for inland areas, having been grown successfully as far inland

as Southern Cross under irrigated conditions. In many areas of our Wheat Belt it is being grown in small patches which retain moisture or can be watered in the summer time.

Cultivation and Method of Planting.

As seed is difficult to procure, propagation is carried out from roots or cuttings.

Roots or young rooted plants are preferable to cuttings, as growth is more rapid, failure to strike very rare, and a cut can be obtained 10-12 weeks after being first planted, if sufficient moisture is available.

A single plant will produce as many as 40-50 young rooted stems in one season.

Rooted plants may be planted at any time of the year, if the soil is moist, but cuttings should only be planted in the spring.

Cuttings should be taken from the hard portions of the stem, and have three joints. Those taken from the softer upper portions of the stem often rot in the soil.

Rooted plants or cuttings should be planted on ground which has been ploughed to a depth of five to seven inches and well cultivated.

Where large areas are to be planted, the cuttings may be dropped in shallow furrows, three inches deep, and the earth ploughed back on to them. Small areas may be "dibbled" in, leaving one node (joint) exposed.

Fertilizer.

Superphosphate at the rate of 2 cwts. per acre should be applied at planting and a subsequent topdressing with at least 1½ to 2 cwts. of superphosphate per acre each spring.

Stable, cow, poultry or any farmyard manure can be applied more or less *ad lib.* with beneficial results.

It has been found that good intercultivation in the autumn and spring is beneficial.

Seed.

Elephant grass has not been known to form viable seed in the temperate portions of the State, *i.e.*, south of Geraldton, though in its native habitat seed is commonly produced.

Seed obtained by Mr. P. G. Hampshire, however, and grown by Hon. E. H. Angelo, M.L.C., Leura Farm, Carnarvon, in 1923, gave a good percentage of germination, namely 47 per cent. which compares favourably with the percentage of germination found in good quality samples of Rhodes grass seed (40 per cent.). It would seem possible, therefore, that should seed be required supplies can be drawn from the North-West of this State.

Value as a Fodder Plant.

Where ample moisture is present, Elephant grass has a remarkable rapidity of growth and stooling characteristics and can be cut four to six times in one season and will produce up to 50 tons of green fodder per acre. It is highly palatable, but becomes coarse if allowed to grow too high. It should be cut when

three to four feet high. Analyses show that the value of this grass is high, figures for Sudan grass and Maize are given for comparison:—

——	Water.	Crude Protein.	Fat.	Carbo-hydrates.	Indig. Fibre.	Ash.
Elephant Grass (N.S.W.)	63.82	3.25	0.41	15.71	14.01	2.80
Sudan Grass	63.9	2.0	1.1	21.5	8.4	3.1
Maize, Green	76.9	1.9	0.6	13.9	5.5	1.2

Over the last few years much attention has been paid to this valuable fodder plant, by dairy farmers and poultry raisers.

THE SOWING OF PASTURE SEEDS.

G. K. BARON-HAY, Superintendent of Dairying, and H. G. ELLIOTT, Agrostologist.

During recent years a considerable and growing interest has been exhibited by farmers in the possibilities of improving the quality of pasture on various types of soil. This has led to numerous inquiries being received by the Department, particularly requesting information regarding the types of soil suitable for the growing of different strains of pasture plants and the rates of seeding recommended for these varieties. It, therefore, is hoped that the following notes setting out briefly the preparation of the soil required for the sowing of pasture seeds, and also the types of plants recommended for varying districts, will serve as a guide to those farmers desiring to improve or resow portions of their land to pasture

Preparation of the Soil: Where subterranean clover alone is being sown good surface scarifying of the soil is required. With the other pasture species, however, independent of the type of soil to be planted, it is essential, in order to secure good germination, that the surface soil be of a fine tilth and that beneath this surface layer, which should be shallow, say, three-quarters of an inch, the seed bed should be well consolidated.

Where mixtures containing perennial grasses are included, it is requisite that the soil should be fertile, and it therefore is undesirable, as a rule, to sow these types of pasture plants on virgin soil.

For pastures containing perennial species the land to be planted should be fallowed in spring, cultivation being carried out during the summer months to consolidate the seed bed and also to destroy germinated weeds. Where the soil is poorly drained, ploughing should be carried out in narrow lands.

The growing of a crop of potatoes or maize during the previous summer may obviate the leaving of the land fallow, and has the effect also of enriching the soil, as these crops usually receive a heavy dressing of fertiliser containing nitrogen, phosphate and potash. Some form of summer cultivation such as that indicated above is necessary, so that the seeds may be planted and germinate early in autumn while the soil is still warm, without fear of competition from weed seeds.

Irrigated land may be freed from weeds by watering, which will germinate these, and a cultivation to destroy the weeds after their germination.

Fertilisers: Phosphatic fertilisers are essential and, on fertile ground containing a good supply of humus or organic manure, 2 cwts. of superphosphate are recommended. Where the pasture mixture contains permanent grasses, however, and there is some doubt as to the fertility of the soil, a fertiliser containing superphosphate five parts to one part nitrogen is recommended, such as superphosphate and ammonia No. 2 at the rate of 2 cwts. per acre.

Depth of Seeding: Pasture seeds should not be sown at a greater depth than three-quarters of an inch, or less than quarter of an inch. If the land is moist to the surface, broadcasting may be practised, followed by a light rolling. A guide in depth of sowing is that "seeds should not be sown deeper than a distance equal to four times their diameter."

Method of Seeding: Drilling is preferred, and has the advantage of giving a better and more even germination. The seed may be mixed with the fertiliser, but mixing should not take place until it is desired to sow, or the seed may be sown through the small seeds attachment which can be attached to a "drill" or "combine."

Should the seed bed be firm, broadcasting the seed and fertiliser, followed by a light brush harrowing, would give good results.

Time of Seeding: Autumn planting is the general rule. Spring planting is only recommended where sufficient moisture is present to insure germination, or irrigation water is available.

Quality of Seed: A great deal of attention has been paid in recent years to the differences found between strains of the same species of pasture plants. Where possible, seeds should be purchased carrying a certificate from some reputable authority, preferably a Government institution, setting out the strain, percentage of germination, freedom from disease and weed seeds. Seed certification aims at providing the producer, the merchant and the purchaser, with some independent and authoritative assurance that the seed certified has certain claims to recognition from the viewpoint of strain and performance. Should the seed purchased be of a low germinating capacity or a non-persistent strain, the total outlay of preparation may be wasted, or, worse still, a direct injury ensue from the harmful nature of weeds introduced.

Rate of Seeding: The rate of application of pasture seeds per acre varies considerably from district to district, owing to the large area of the State deemed suitable for the growth of some species of pasture plants. The amount of seed to be sown when endeavouring to establish pasture depends on several factors, as follows:—

1. Type of soil.
2. The variety and quality of seed.
3. The condition of the seed bed.
4. The seed mixture to be sown.
5. The climatic conditions governing the district in question.

In all instances, however, the aim in pasture production is to cover the surface of the land with an even sward of fodder as quickly as possible.

The following tables setting out the rates of seeding recommended have been prepared to suit average conditions, where farmers have already certain species present in their pastures they can alter the given mixtures recommended. Each mixture has been carefully compiled from experimental data obtained giving due regard to the soil and climatic conditions.

"A." Where pure stands of any particular variety are to be sown without a cover crop.

"B." For the sowing of pure stands of a particular variety with a cover crop.

"C." The sowing of pasture mixtures under various conditions.

"A."—*Pure Stands Without Cover Crop.*—Table 1 sets out the rate of seeding recommended for single plant pastures in the three main districts of the State identified by rainfall:—

TABLE 1.

RATE OF SEEDING FOR SINGLE PLANT PASTURE.

Seed.	South and South-West Rainfall of 28in. to 60in.	Areas with Rainfall of 18in. to 28in.	Areas with Rainfall of 18in. and less.
	lbs. per acre.	lbs. per acre.	lbs. per acre.
Wimmera Ryegrass	8 to 10	4 to 6	4 to 6
Italian Ryegrass	8 „ 15	6 „ 8	(*b*)
Perennial Ryegrass	6 „ 10	6	(*b*)
Cocksfoot	6 „ 10	(*a*)	(*b*)
Phalaris tuberosa	2 „ 3	2	1 to 2
Veldt Grass	2 „ 4	2 „ 4	2
Yorkshire Fog	2 „ 6	(*a*)	(*b*)
Timothy	4 „ 6	(*a*)	(*b*)
Tall Fescue	6 „ 10	4 „ 6	(*b*)
Subterranean Clover	4 „ 8	2 „ 4	4 to 6
Drooping Flowered Clover (Scarified)	2 „ 4	2 „ 4	(*b*)
White Clover	2 „ 4	(*a*)	(*b*)
Cluster Clover	4 „ 6	4 „ 6	3 to 4
Suckling Clover	4 „ 6	4 „ 6	3 „ 4
Red Clover	6 „ 8	(*a*)	(*b*)
Lucerne	8 „ 12	4 to 8	3
Burr Medic	6 „ 10	6	4
Barrel Clover	4	3 „ 4	2 to 4
Lotus major	2 „ 4	(*a*)	(*b*)
Lupins	½ to 1 bush	½ to 1 bush.	(*a*)

(*a*) Only recommended on favourable light or moist land.

(*b*) Not recommended to plant.

"B"—*Pure Stand With a Cover Crop.*—In many districts the practice of establishing pasture in two years by the use of a cover crop is quite common. The advantage of this method is that less seed per acre of the pasture plants is required, as these plants will thicken during the second year by seeding, only annual pasture plants being generally used.

Table 2 gives the rate of seeding where such pure stands are required following a cover crop, usually a cereal:—

TABLE 2.

SEEDS SOWN WITH A COVER CROP.

Seed.	South and South-West Rainfall, 28in. to 60in.	Rainfall of 18in. to 28in.	Rainfall of 18in. and less.
	per acre.	per acre.	per acre.
Wimmera Ryegrass	4 lbs.	2–3 lb.	½–1½ lb.
and Oats	1½–2 bush.	1 bush.	1 bush.
or Wheat	1–1½ „	45–60 lbs.	45 lbs.
Subterranean Clover	2–4 lbs.	1–2 lbs.	2–4 lbs.
and Oats	1–2 bush.	½–1 bush.	½ bush.
Crimson Clover	4–6 lbs.	3–4 lbs.	...
and Barley	1–1½ bush.	1 bush.	...
Wimmera Ryegrass	2–3 lbs.	2 lbs.	...
Subterranean Clover	2–3 „	2 „	...
and Oats	1 bush.	1 bush.	...
Lupins	...	2–6 lbs.	2–6 lbs.
and Wheat	...	45–60 lbs.	45 „

"C."—*Pasture Mixtures.*—These are usually sown in the heavier rainfall districts of the State, and any mixture should contain tall, strong-growing high-fertility grasses with a proportion (approximately 40 per cent.) of legumes. The particular mixture decided upon is governed mainly by the type of soil available and the prevailing climatic conditions.

To assist in deciding upon the mixture to be sown, Table 3 sets out the various types of soil commonly met with in the south-west portion of the State on which it is desired to establish permanent pasture.

TABLE 3.

SOIL TYPES FOR THE SOWING OF PASTURES IN THE SOUTH-WEST.

A.—Well-drained undulating country omitting gravel hills, *i.e.*—

1. With over 40 inches rainfall, *i.e.*, Denmark, Manjimup, Margaret River;
2. With 30-40 inches rainfall, *i.e.*, Donnybrook, Bridgetown.

B.—Coastal plain type: Clay loam to a heavy clay carrying red gum, flooded gum, generally requires draining, *i.e.*, Benger, Cookernup, etc.

C.—Summer moist land, excluding drained peaty swamp, including certain portions of Napier Creek country.

D.—Drained peaty swamps.

E.—Sandy to sandy loam waterlogged in winter, often carrying peppermint, stunted jarrah, etc., *i.e.*, low country around Busselton.

F.—Same as "E," but with clay subsoil, *i.e.*, 4-8 inches.

G.—Dry, more or less gravelly ridges.

Mixtures Recommended.—The various mixtures recommended under different conditions, and for the various types of soil indicated in Table 3 above, are concisely grouped in Table 4 according to whether the land to be sown is—

(a) Virgin land;
(b) Old cultivated non-irrigable land ("dry").
(c) Irrigated land.

In sowing these pasture mixtures, particular attention should be paid to the fertility of the soil and reference made to a paragraph on "fertilisers" earlier in this article.

TABLE 4.

SEED MIXTURES FOR VARIOUS SOIL TYPES—POUNDS PER ACRE

VIRGIN LAND—AUTUMN SOWING.

A1.—Italian Ryegrass, 4-6 lbs.
Subterranean Clover, 2-4 lbs.
White Clover (certified), 1 lb.

*A2.—Italian Ryegrass, 4-6 lbs.
Subterranean Clover, 2-4 lbs.

B.— Italian or Wimmera Ryegrass, 4-6 lbs.
Subterranean Clover, 2-4 lbs.
Drooping Flowered Clover (scarified seed), 1 lb.

*B.— Italian or Wimmera Ryegrass, 4 lbs.
Subterranean Clover, 4 lbs.

C.— Spring or early autumn seeding:
Paspalum dilatatum, 10 lbs.
White Clover (certified), 1 lb.
Lotus major, 1 lb.

D.—Perennial Ryegrass (cert.), 4 lbs.
Cocksfoot (certified), 2 lbs.
Lotus major, 3 lbs.

D.—Perennial Ryegrass (cert.), 4 lbs.
White Clover (certified), 2 lbs.
Lotus major, 2 lbs.

E.—Drooping Flowered Clover (scarified seed), 2 lbs.
Yorkshire Fog, 2 lbs.

F.—Subterranean Clover, 2 lbs.
Drooping Flowered Clover (scarified seed), 2 lbs.

G.—Wimmera Ryegrass, 6 lbs.
Cluster Clover, 4 lbs.

* Kikuyu planted at 3 ft. intervals.

OLD CULTIVATED LAND— AUTUMN SOWING.

A1.—Perennial Ryegrass (cert.), 4-6 lbs.
Cocksfoot (cert.), 2 lbs.
Subterranean Clover, 4 lbs.
White Clover (cert.), 1 lb.

*A1.—Perennial Ryegrass (cert.), 4 lbs.
Cocksfoot (cert.), 4 lbs.
Subterranean Clover, 4 lbs.
White Clover (cert.), or *Lotus major*, 1 lb.

A1.—*Phalaris tuberosa* (cert.), 2-3 lbs.
Subterranean Clover, 3-4 lbs.

A2.—Perennial Ryegrass (cert.), 4 lbs.
Subterranean Clover, 4 lbs.

A2.—*Phalaris tuberosa* (cert.), 2-3 lbs.
Subterranean Clover, 3-4 lbs.

* Kikuyu planted at 3 ft. intervals.

Note.—Subterranean Clover where recommended only to be added if not already present.

IRRIGATED LAND—SPRING OR EARLY AUTUMN SOWING.

NEW LAND.

Paspalum dilatatum ..	.. 8 lbs.
White Clover (cert.)	.. 2 lbs.
Subterranean Clover	.. 2 lbs.

OLD LAND.

1.—Perennial Ryegrass (cert.), 6-8 lbs.
Cocksfoot (cert.), 2-4 lbs.
White Clover (cert.), 2 lbs.

2.—Perennial Ryegrass (cert.), 8 lbs.
White Clover (cert.), 2 lbs.

3.—Perennial Ryegrass (cert.), 6 lbs.
Paspalum dilatatum, 4 lbs.
White Clover (cert.), 2 lbs.

4.—*Phalaris tuberosa* (cert.), 3 lbs.
White Clover (cert.), 2 lbs.

THE SMALL SEEDED HORSE OR TICK BEAN.

(Vicia faba var minor.)

H. G. ELLIOTT,
Agrostologist.

Introduction.

Horse or Tick Bean varieties are numerous but one of the most outstanding ones in this State is that known as the Bell Windsor Tick Bean. The seeds of this bean were first introduced in 1935 to this State from California, by Dr. T. C. Dunne. then Research Officer in Agrostology at Muresk Agricultural College. At the Denmark Research Station the high yield and quality of this crop has been demonstrated. This, together with its high feeding value indicates that the beans can be used to advantage much more extensively in Western Australia than is the case at the present time.

In Western Australia there is need of a legume for green manuring purposes that will grow more rapidly during the cold winter months than peas or vetches. The tick bean has demonstrated its ability to grow satisfactorily during the cold wet months, but has one objection in that it requires a fairly high rate of seeding per acre, owing to the size of the seed. The Bell Windsor variety, however, has a small seed and the rate of seeding per acre is not much in excess of that of peas.

Description of Plant.

The Tick Bean plant is an annual legume belonging to the vetch group. It is erect, with one or more large unbranched coarse stems and large leaves without tendrils. The plant attains a height of 2 to 7 feet. The leaves consist of from one to three pairs of large oval leaflets and are distributed from the base to the tip of the stems. The white flowers with dark purple markings, are borne in clusters of one to five on short stalks in the axils of the leaves. From two to five pods develop from each flower cluster. The size and colour of the seeds vary with the varieties. There is usually one strong central root with numerous spreading lateral rootlets covered with nodules when the suitable nitrogen fixing bacteria is in the soil.

Uses.

The large flat seeded varieties are used extensively as a vegetable either in a green or dry state while the small seeded varieties are seldom used for this purpose. The plant may be made into hay or silage, fed green, or ploughed in as a green manure. The beans can be used as a substitute for grain in rations of pigs or cows, and can be also ground up and form a portion of the ration for poultry.

The seeds are very high in protein as may be seen from the following analysis: moisture, 12.75 per cent.; protein, 25.41 per cent.; fat, 2.01 per cent.; fibre, 11.57 per cent.; nitrogen free extract, 45.43 per cent.; ash, 2.83 per cent. This analysis is given on an undried basis.

Soil.

Tick beans normally thrive best on heavy well drained loams, but will succeed on most types of sandy to heavy loamy soils. The plants thrive best during the winter months but do not succeed during the hot weather.

Time of Planting.

Autumn and early winter are recognised as the best times for planting the seed of this excellent and useful fodder. Sowing immediately after the event of the general winter rains in May is recommended.

Method of Sowing

It is recommended that the seed be sown in drills about 30in apart, so that inter-tillage can take place during the early life of the plants to assist in controlling weeds. In the lower rainfall areas, however, it is recommended that the seed be planted on fallow. A simple method of seeding is to lightly plough in the seed every third furrow of about 9in. wide, thus making rows about 27 to 30 inches apart.

A horse or tick bean plant three weeks old.
Photo. P. B. Kennedy.

Inoculation.

Inoculation is essential where these beans are being sown on land which has not previously grown a crop of Tick, Horse or Broad Beans, or has not previously grown a crop of peas. Cultures can be obtained at a small cost from the Plant

Pathologist of this Department for inoculating the seed just prior to planting. Full instructions with reference to the method of inoculating is sent out with the culture.

A typical root of horse bean.
Photos. P. B. Kennedy.

Single stalk of the horse bean showing 64 pods. Illustrating unusual large number of pods per stem.

Fertiliser.

An application of 2 cwt. to 3 cwt. of superphosphate is recommended per acre. On light sandy types of soils a small application, say ½ cwt. of sulphate of potash per acre would be advantageous.

Treatment After Sowing.

It is necessary to cultivate thoroughly between the rows to check weeds and conserve moisture which is required for the crop. This cultivation should be carried out until the beans are at least 6in. to 9in. high. From then on the beans are able to compete successfully with weeds.

Yields.

Very heavy yields of seed have been obtained from this bean under experiment, as much as 60 bushels per acre having been obtained during last season. The method adopted for harvesting is to cut when the bulk of the seed pods are just about dry, stook, then stack. Later the seed is thrashed out of the straw.

EXPORTATION OF APPLES AND PEARS.

SPECIAL REQUIREMENTS FOR 1940 SEASON.

The Secretary, Department of Commerce, has drawn attention to the fact that during the 1939 apple and pear export season, which is now drawing to a close, many consignments of apples and pears were packed in "Standard" boxes which did not comply with the specifications prescribed in the Exports (Fresh Fruits) Regulations.

Exporters and others interested in the supply to fruit growers of case material are advised that during the 1940 season "Standard" boxes for the export of apples and pears must conform to the following specifications:

Standard Apple Box.

(a) Each end shall be 11½ inches deep by 10½ inches wide by not less than ⅝ inch nor more than ¾ inch thick.

(b) Each side shall be 10½ inches wide by not less than 19¼ inches nor more than 19½ inches long. If made of soft wood, it shall be of one piece or two pieces 5 16 inch thick. If made of hard wood, it shall be of one piece ¼ inch thick or of two pieces 5/16 inch thick.

(c) The bottom shall be not less than 19¼ inches nor more than 19½ inches long. If made of soft wood, it shall be of two pieces each 5½ inches wide by 3 16 inch thick. If made of hard wood, it shall be of one, two or three pieces aggregating 11 inches wide by 3/16 inch thick. If a unitized bottom is used, it shall be of two, three or four pieces aggregating 11 inches wide by not less than ⅛ inch nor more than 3/16 inch thick.

(d) The top shall be not less than ⅛ inch nor more than ¼ inch longer than the bottom. If made of soft wood, it shall be of two pieces each 5½ inches wide by 3 16 inch thick. If made of hardwood, it shall be of one, two or three pieces aggregating 11 inches wide by 3/16 inch thick. If a unitized top is used, it shall be of two, three or four pieces aggregating 11 inches wide by not less than ⅛ inch nor more than 3/16 inch thick.

(e) A cleat shall be used at each end of the top and bottom and shall be not less than 11 inches nor more than 11½ inches long by not less than ⅝ inch wide by not less than 5/16 inch thick.

Standard Pear Box.

(a) Each end shall be 11½ inches wide by 8½ inches deep by not less than ⅝ inch nor more than ¾ inch thick.

(b) Each side shall measure 8½ inches wide by not less than 19¼ inches nor more than 19½ inches long. If made of soft wood, it shall be of one piece only, 5/16 inch thick. If made of hard wood, it shall be of one piece ¼ inch thick or of two pieces 5/16 inch thick.

(c) The bottom shall be not less than 19¼ inches nor more than 19½ inches long. If made of soft wood, it shall be of two pieces each 5½ inches wide by not less than 3/16 inch nor more than ¼ inch thick. If made of hard wood, the

bottom shall be of one, two or three pieces aggregating 11 inches wide by 3/16 inch thick. If a unitized bottom is used it shall be of two, three or four pieces aggregating 11 inches wide by not less than ⅛ inch nor more than 3/16 inch thick.

(d) The top shall be not less than ¼ inch nor more than ½ inch longer than the bottom. If made of soft wood it shall be of two pieces each 5½ inches wide by 3/16 inch thick. If made of hard wood, it shall be of one, two or three pieces aggregating 11 inches wide by 3/16 inch thick. If a unitized top is used, it shall be of two, three or four pieces aggregating 11 inches wide by not less than ⅛ inch nor more than 3/16 inch thick.

(e) A cleat shall be used at each end of the top and bottom and shall not be less than 11 inches nor more than 11½ inches long by not less than ⅝ inch wide by not less than 5/16 inch thick.

Special attention is invited to the requirement that the tops of the "Standard Apple Boxes" are required to be not less than ⅛ inch nor more than ¼ inch longer than the bottoms and in regard to "Standard Pear Boxes" not less than ¼ inch nor more than ½ inch longer than the bottoms. This is to provide allowance for bulge packing. Special attention is also drawn to the thicknesses of the top and bottom timber. These are:

Standard Apple.—Bottoms: 3/16 inch (or ⅛ inch to 3/16 inch if unitized). Tops: 3/16 inch (or ⅛ inch to 3/16 inch if unitized).

Standard Pear.—Bottoms: 3/16 inch (or ⅛ inch to 3/16 inch if unitized). Tops: 3/16 inch (or ⅛ inch to 3/16 inch if unitized).

Standard Apple Boxes must contain not less than 42 lb. weight of fruit, except in the case of large-sized apples and apples of light varieties.

Standard Pear Boxes must contain not less than 40 lb. weight of fruit.

THE COMPOSITION OF WHEAT AND OAT GRAIN GROWN IN WESTERN AUSTRALIA.

L. C. SNOOK, Institute of Agric., University of Western Australia.

Dadswell (1935), and Underwood and Snook (1935) have shown that Australian cereal grains are characterised by a low total ash content and may contain only half the phosphorus present in normal English or American grains. The series of analyses reported in the paper by Underwood and Snook (1935) have been continued and the additional data confirm the findings previously recorded. There is no need to duplicate the full description and discussion given in the earlier paper, but the full analytical data will be given here, along with a few supplementary comments.

The following Tables (Tables I.-VI.) show the variations in composition of wheat and oat grain, according to season and district where grown, over a period of five years. The three Agricultural Research Stations from which the samples were obtained represent distinct soil and climatic zones, but the cultural and manurial treatments of all the crops were similar.

Remarks.

The figures recorded in the various Tables (Tables I.-VI.) appear to supply definite proof that, in general, Western Australian cereals contain considerably less ash and only about half the phosphorus present in "standard" English and American grains. Grains from some districts such as Wongan Hills may be particularly deficient in phosphorus. The possible nutritional significance of this low phosphorus content has been discussed in another paper (Snook, 1938).

TABLE I.

WHEAT GRAIN.—THE COMPOSITION OF THE STANDARD "FAIR AVERAGE QUALITY" BLEND OF WESTERN AUSTRALIAN WHEAT.

(As a percentage of the dry matter.)

——	Year.	Nitrogen.	Crude Protein. (F = 5·83)	Total Ash.	Ca.	P.
F.A.Q.	1927	1·89	11·03	1·67	0·04	0·23
	1929	2·06	12·01	1·55	0·04	0·22
	1930	1·90	11·08	1·53	0·05	0·24
	1933	1·91	11·14	1·46	0·04	0·22
	1934	2·05	11·95	1·35	0·03	0·23
	1935	1·84	10·72	1·38	0·04	0·27
	1936	2·08	12·13	1·43	0·04	0·26
Average	...	1·96	11·43	1·48	0·04	0·24
"Standard" English Wheat (Marshall & Halnan, 1932) ...	...	2·44	14·22	1·96	0·05	0·47

TABLE II.

COMPOSITION OF GRAIN GROWN AT MERREDIN RESEARCH STATION.

(As a percentage of the dry matter.)

——	Year.	Nitrogen.	Crude Protein. (F = 5·83)	Total Ash.	Ca.	P.	Rainfall during May-Oct.
							inches.
Wheat (variety "Nabawa")	1932	2·10	12·25	1·64	0·04	0·28	11·13
	1933	2·37	13·81	1·61	0·035	0·24	9·51
	1934	2·44	14·22	1·50	0·04	0·24	6·44
	1935	2·58	15·04	1·54	0·035	0·27	7·64
	1936	3·64	21·22	1·79	0·05	0·33	7·03
Average	...	2·63	15·33	1·62	0·04	0·27	...
			(F = 5·83)				
Oats (variety "Mulga")	1932	2·00	11·66	3·94	0·06	0·24	11·13
	1933	1·96	11·43	3·11	0·05	0·21	9·51
	1934	2·00	11·66	3·04	0·07	0·22	6·44
	1935	1·99	11·60	2·74	0·06	0·25	7·64
Average	...	1·99	11·60	3·21	0·06	0·23	...

(The total ash of the oat grain contained about 40% to 45% SiO_2.)

TABLE III.

COMPOSITION OF GRAIN GROWN AT WONGAN HILLS RESEARCH STATION.

(As a percentage of the dry matter.)

——	Year.	Nitrogen.	Crude Protein. (F = 5·83)	Total Ash.	Ca.	P.	Rainfall during May-Oct.
							inches.
Wheat (variety "Nabawa")	1932	1·48	8·63	1·53	0·05	0·24	16·27
	1933	1·63	9·50	1·55	0·04	0·20	12·60
	1934	1·71	9·97	1·4	0·035	0·24	9·26
	1935	1·64	9·56	1·16	0·035	0·19	9·71
	1936	1·53	8·92	1·20	0·04	0·23	8·78
Average	...	1·60	9·33	1·37	0·04	0·22	...
			(F = 5·83)				
Oats (variety "Mulga")	1932	1·40	8·16	3·46	0·06	0·23	16·27
	1933	1·37	7·99	3·54	0·06	0·21	12·60
	1934	1·60	9·33	2·80	0·06	0·17	9·26
	1935	1·42	8·28	2·95	0·07	0·19	9·71
Average	...	1·45	8·45	3·19	0·06	0·20	...

(The total ash of the oat grain contained about 50% SiO_2.)

TABLE IV.

COMPOSITION OF GRAIN GROWN AT CHAPMAN RESEARCH STATION.

(As a percentage of the dry matter.)

——	Year.	Nitrogen.	Crude Protein. (F = 5·83)	Total Ash.	Ca.	P.	Rainfall during May-Oct.
							inches.
Wheat (variety "Nabawa")	1932	1·75	10·20	1·58	0·04	0·28	17·16
	1933	1·55	9·04	1·64	0·025	0·37	18·96
	1934	1·81	10·55	1·7	0·05	0·37	13·51
	1935	1·72	10·02	1·66	0·04	0·31	10·13
	1936	1·67	9·74	1·60	0·04	0·30	14·27
Average	...	1·70	9·91	1·64	0·04	0·33	...
			(F = 5·83)				
Oats (variety "Mulga")	1932	1·27	7·40	4·07	0·09	0·26	17·16
	1933	1·73	10·09	3·60	0·05	0·32	18·96
	1934	1·28	7·46	3·71	0·08	0·27	13·51
	1935	1·56	9·09	3·24	0·07	0·22	10·13
Average	...	1·46	8·51	3·66	0·07	0·27	...

(The total ash of the oats grown in 1935 contained about 54% SiO_2.)

TABLE V.

COMPOSITION OF OAT GRAIN (VARIETY "MULGA") GROWN AT NUNGARIN.

(As a percentage of the dry matter.)

Year.	Nitrogen.	Crude Protein. (F = 5·83)	Total Ash.	Ca.	P.	Rainfall during May-Oct.
						inches.
1932	2·09	12·21	3·88	0·06	0·24	10·98
1933	1·88	10·96	3·03	0·07	0·24	8·36
1935	2·66	15·51	3·23	0·07	0·31	7·10
Average	2·21	12·88	3·38	0·07	0·26	...

(The total ash of the oat grain grown in 1935 contained about 34% SiO_2.)

TABLE VI.

AVERAGE COMPOSITION OF WESTERN AUSTRALIAN CEREAL GRAINS.

(As a percentage of the dry matter.)

District in which Sample was grown.	Total Nitrogen.	Crude Protein. (F = 5·83)	Total Ash.	Ca.	P.	No. of Years Averaged.
Wheat—						
Merredin	2·63	15·33	1·62	0·04	0·27	5
Wongan Hills	1·60	9·33	1·37	0·04	0·22	5
Chapman	1·70	9·91	1·64	0·04	0·33	5
"Fair Average Quality" ...	1·96	11·43	1·48	0·04	0·24	7
"Standard" English (Marshall & Halnan)	2·44	14·22	1·96	0·05	0·47	...
Oats—		(F = 5·83)				
Merredin	1·99	11·60	3·21	0·06	0·23	4
Wongan Hills	1·45	8·45	3·19	0·06	0·20	4
Chapman	1·46	8·51	3·66	0·07	0·27	4
Nungarin	2·21	12·88	3·38	0·07	0·26	3
"Standard" English (Marshall & Halnan)	1·90	11·08	3·57	0·10	0·39	...
Scottish ("Victory"), Aberdeen, 1936	1·52	8·86	3·26	0·10	0·42	...

The protein content of wheat and oat grain, of the same variety for each species, varies considerably according to district of origin. This may be of some importance where grain is purchased for stock-feed, as during the long summer months many grazing animals in Western Australia receive inadequate supplies of protein and the protein in grain supplements may be of considerable significance in maintaining good health. The findings of Csonka (1937) are of interest in this regard. He reports that the quality of the protein in wheat grain improves as the total content of the grain rises. Where wheat protein is of value in supplementary feeding it seems that cereals grown in the eastern wheat-belt (the areas including Merredin and Nungarin) will be worth more than cereals grown at Wongan Hills or Chapman.

The grain of "Nabawa" wheat contains more crude protein than that of "Mulga" oats grown on the same farm. As there is little qualitative difference between the protein in the two cereals (see "Wheat," 1936) the oat grain commonly used as stockfood can be replaced as required by wheat whenever relative prices warrant the substitution. Wheat grain is a safe and palatable foodstuff for stock, if used correctly (see Snook, 1933).

Efforts were made to discover some correlation between rainfall and the total nitrogen content of the cereal grains. No such relationship is apparent. Climate is undoubtedly an important factor in determining the protein content of wheat grain but it seems that in the samples under review, other variables mask the climatic effects. There seems to be no constant relation between the varying amounts of protein found in wheat and oat grain from the same farm in different years. The protein contents of the two grains appear to be controlled by different factors.

Table VII.

SHOWING THE RELATIVE SIZE OF THE VARIOUS GRAINS.

District in which Sample was grown.	Mass of a 1,000 grains.	Percentage Nitrogen.
Wheat—	grams.	%
Merredin, 1935	51·5	2·58
Merredin, 1936	54·6	3·64
Wongan Hills, 1936	51·1	1·53
Chapman, 1936	62·7	1·67
Nungarin, 1936	40·2	2·76
Oats—		
Wongan Hills, 1935	44·9	1·42
Nungarin, 1935	22·0	2·66
Scottish, 1936	53·1	1·52

It is known that wheat grain which has been shrivelled by hot dry weather during the ripening period, is generally of high protein content. It can be seen from Table VII. that the high protein content of the Merredin samples is not due to "shrivelling"; in fact, the samples as analysed from this centre consisted of grains of large size and excellent appearance. Dadswell (1935) determined the weight of 1,000 grains from each of 23 samples of Victorian wheat, and the average value for the series was 40.4 grams per 1,000 grains (range 49.5-34.5). If this figure is typical the Western Australian grains seem plump in comparison.

The oat grain grown in the eastern districts of Western Australia, however, would be considered of very poor quality by farmers familiar with the plump grains, with a minimum of husk, grown in moister climates. None-the-less, it can be seen that the thin, husky, Nungarin oat (Table V.) contains more crude protein than the attractive Scottish oat of double the size. Oat grain is held in high esteem by Western Australian farmers as a stock food, and this esteem may not be unconnected with a high crude protein content.

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CLEAN MILK COMPETITION, BRUNSWICK, 1938-39.

M. Cullity.

In view of the success attending previous clean milk competitions, carried out in this State, at Balingup, Manjimup and Serpentine, Messrs. Brownes, Ltd., of Brunswick, decided to offer prizes for the best milk delivered at their receiving depot and cheese factory as shown by periodic examinations of the milk from each supplier. A trophy was also offered to the farmer who marketed milk of the highest average quality during the whole period during which the competition was being held.

In order to facilitate operations, judging was confined to a survey of the amount and type of sediment in the milk as disclosed by the use of the sediment test, and the number of bacteria as shown by a direct count. Points were allotted according to the following scale at each inspection:—

Sediment	20 points.
Bacteria	100 „
Total	120 „

The score for bacteria was not in proportion to the number of organisms present but according to the following scale, which was adopted as giving a fairer basis because of the greater rapidity of increase in numbers of a highly contaminated sample as compared with one not so badly contaminated. This was necessary as the unavoidable time lag between milking and the collection of the samples was lengthened by the necessity of conveying the samples to Bunbury without cooling. As the time at which the slides were prepared was nearly 11 a.m. on each occasion, it will be realised that a survey of the actual counts would not give an accurate indication of the condition of the milk as it was received at the depot.

The scale for the allocation of points for bacteria was as follows:—

	points.
10,000 bacteria /cc. and under	100
10,000 to 31,000 bacteria /cc.	95
31,000 „ 100,000 „	90
100,000 „ 310,000 „	80
310,000 „ 1,000,000 „	70
1,000,000 „ 3,100,000 „	50
3,100,000 „ 10,000,000 „	25
over 10,000,000 „	0

In order to familiarise the suppliers with the procedure of sampling and to give them some idea of the quantity of the milk produced on their farms, a trial test was made. Samples for the competition were then collected on the following dates: 14th October, 28th October, 22nd December, 1938, and 1st February, 1939.

The general results for the individual suppliers are as indicated in Table 1.

That the quality of the milk improved during the competition is shown by block "a." It should be remembered that samples were collected at irregular intervals and without notice. The latest series of samples was taken during the summer months, when the weather conditions would be conducive to dust in the atmosphere of the milking yards and more rapid multiplication of bacteria in the

milk because of the higher temperatures. Milk from three farms declined in quality during the period, probably due to the conditions mentioned rather than a decline in the methods used.

TABLE 1.

	Inspection 1.			Inspection 2.			Inspection 3.			Inspection 4.			Grand Total.
	14–10–38			28–10–38			22–12–38			1–2–39			
	S.	B.	T.	S.	B.	T.	S.	B.	T.	S.	B.	T.	
D. Harding (3)	0	95	95	16	80	96	16	95	111	14	90	104	406
T. Stanley (10)	14	70	84	13	70	83	9	90	99	9	90	99	365
A. S. Warburton (2)	8	90	98	14	70	84	9	70	79	16	80	96	357
W. Reeve (12)	10	70	80	8	50	58	14	80	94	13	80	93	325
8	12	50	62	7	80	87	12	90	102	10	25	35	286
4	0	80	80	10	25	35	7	70	77	10	80	90	282
17	8	70	78	8	50	58	10	80	90	8	25	33	259
7	14	25	39	15	70	85	9	25	34	16	80	96	254
13	12	0	12	3	25	28	11	90	101	11	70	81	222
5	13	25	38	12	25	37	16	50	66	15	50	65	206
1	3	0	3	9	70	79	7	25	32	10	80	90	204
6	15	0	15	11	0	11	14	80	94	8	70	78	198
9	9	25	34	8	50	58	7	0	7	15	70	85	184
15	14	70	84	12	50	62	7	25	32	...	...	...	178
19	0	50	50	0	90	90	8	25	33	...	...	...	173
16	8	0	8	11	70	81	10	70	80	...	...	...	169
11	12	50	62	13	25	38	11	25	36	8	0	8	144
14	9	25	34	7	25	32	8	0	8	6	25	31	105
18	9	25	34	0	50	50	7	0	7	7	0	7	98

S. = Sediment. B. = Bacteria. T. = Total.

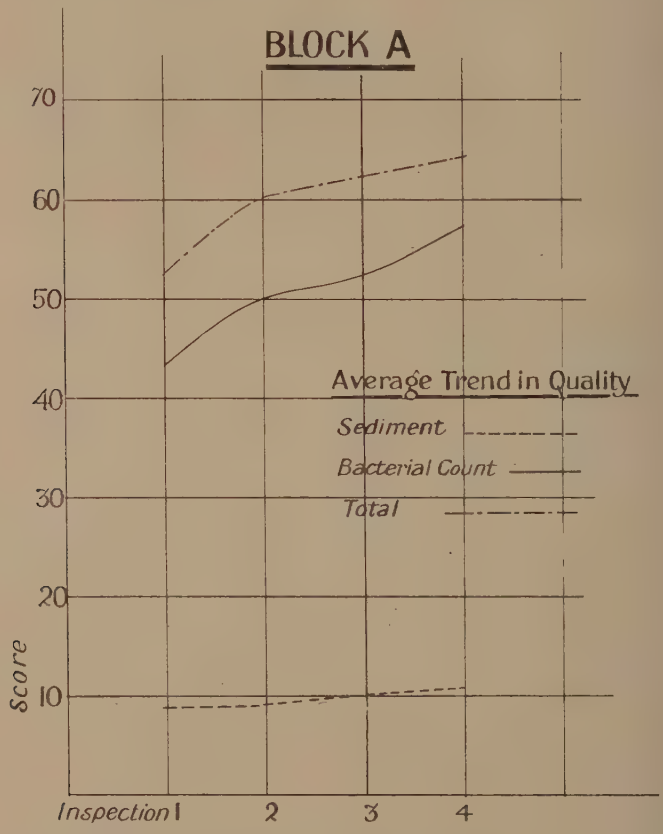
Block "b" shows a comparison between the trends in quality of four groups of milks, including one group representing those declining in quality. The curve for the average of all milks is used as a standard. It will be seen that the average of the remainder when the three which declined in quality are withdrawn shows a very steady rate of improvement. This illustrates very well the effect a few poor quality samples have on a number. The rapid improvement following instruction where the incentive to improve is present is also illustrated. The farms of the suppliers of the four lowest quality milks at the time of the first inspection were visited, after the second series of samples were collected. The block indicates that the milk from these farms was of equal quality to the remainder at the third inspection. The readiness with which the advice was adopted was a good demonstration of the natural desire of the average farmer to produce a high quality article.

Mastitis:

One alarming aspect of the competition was the large number of milks with high leucocyte counts, which probably indicates the presence of mastitis in the majority of the herds. It is probable that the use of milking machines without regular precautionary examination of the cows is contributing to the spread of the disease. It is suggested that apart from any other consideration, and there are others, that each cow be started, that is, made to let the milk down before attaching the teat cups. This allows the milker to examine the milk and the udder for any abnormalities. When any defect is apparent the cow should be put out of the shed and milked, preferably by hand, when the remainder of the herd has been finished.

Hand versus machine milking:

The results indicate that most of the milking machines were being operated in a reasonably clean manner In previous competitions of this nature, hand produced milk figured prominently in the results. In this case, however, the hand milking dairies filled the second, fifth, seventh, thirteenth, fourteenth and sixteenth places among the sixteen competitors who took part in the four inspections. The spread in quality of both hand and machine produced milk appears to indicate that there is not any considerable advantage in either method for producing a clean milk under our average farm conditions.



Value of proper knowledge of care of a milking machine:

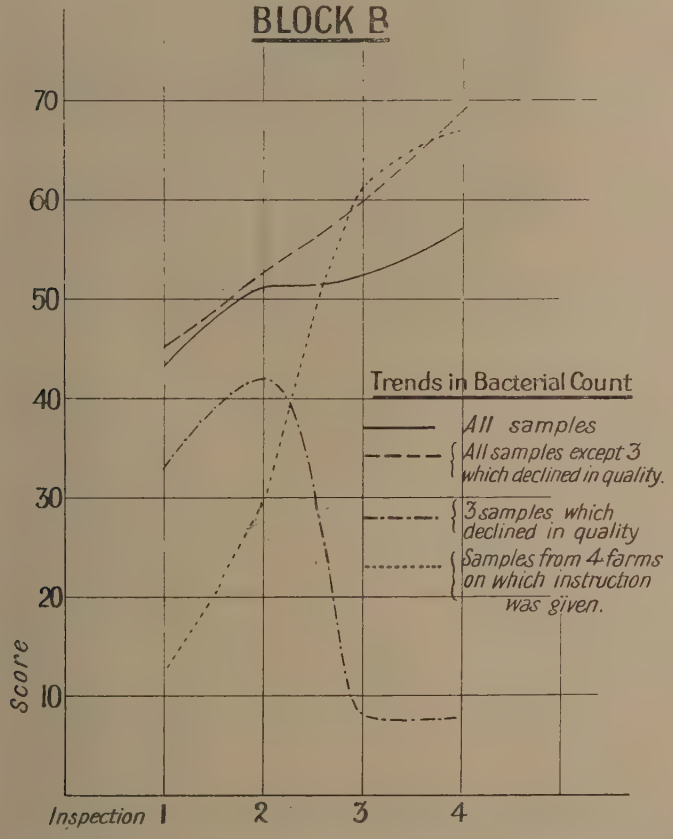
As indicated previously, those farmers who were visited eventually succeeded in producing a greatly improved milk. In each case the reason for the failure to produce milk of good quality could be attributed not to carelessness on the part of the farmer, but to a misunderstanding of the principles of dairy cleansing, particularly of those surfaces which could not be inspected, such as the interior of rubber tubes, milk pipes, etc.

In view of the impossibility of visiting all of the farms, an attempt was made to stimulate improvement by conversation at the depot and by the display of a

chart, showing the effect of various practices related to the production and handling of milk.

Correlation between sediment test and bacterial count:

From a perusal of Table 1, it appears obvious that there is no connection between the result of a sediment test and the number of bacteria that may be present in the milk. In block "a" it will be noticed that an improvement of both sediment tests and bacterial counts occurred during the competition. While the curves follow similar routes, a comparison of the results from individual farms appears to indicate that the similarity is one only of improved quality rather than a direct relationship between the amount of sediment and the number of bacteria. The use of the sediment test, however, was useful in promoting a sense of dairy hygiene, and for this reason can be highly commended.



Acknowledgments must be made of the assistance of the South-West Co-operative Dairy Farmers, Ltd., who agreed to their bacteriologist carrying out the bacterial counts, and to Mr. D. G. Griffin for actually doing this work. Acknowledgment is also made to Mr. H. Kretchmar for suggestions regarding the method of allocation of points for bacterial content.

THE SHEEP BLOW-FLY PROBLEM.

C. F. H. Jenkins,
Government Entomologist.

Much research work has been done on the blow-fly problem during the last few years by the Council for Scientific and Industrial Research and the various State Departments of Agriculture, and the ensuing article is an attempt to present in a form useful to the farmer, the more important results of this work.

During the past autumn the blow-fly has been particularly active in the pastoral and farming areas, and the percentage of fly-strikes has been higher than for a number of years past. Complaints have reached this Department from various centres stating that a new fly has made its appearance in the district and that it is characterised by the fact that it attacks the back and loins of the sheep, rather than the crutch.

The high incidence of body strike has certainly been a feature of the season's infestations, but from the ensuing article it will be seen that environmental conditions and not any particular kind of fly, were responsible for this.

TYPES OF FLIES.

The flies which attack sheep may be divided into three groups according to the part they play in the phenomenon known as fly strike, and the recognition of this grouping is important for the understanding of how blow-fly strike and the resultant myiasis is brought about.

Firstly, there are what are known as primary flies. These are able to initiate a strike on a living animal.

Secondary flies are those which normally are incapable of initiating a strike, but which follow the primary flies and take advantage of the conditions set up by their maggots.

Tertiary flies produce maggots which feed upon the matted wool or around the scabs of wounds and so have little economic bearing.

List of Flies which may be found attacking Sheep in Western Australia.

Primary Flies.

Lucilia cuprina Wied. (Primary Green Blowfly).
Lucilia sericata Meigi. (European Green Blowfly).
Calliphora nociva Hardy (The Blue-tailed Blowfly).
Calliphora australis Bd. (Western Australian Blowfly)).

Secondary Flies.

Chrysomyia rufifacies Mcq. (Secondary Green Blowfly).
Microcalliphora varipes Mcq. (Small Green Blowfly).
Sarcophaga sp.

Tertiary Flies.

Peronia rostrata R.-D.
Musca domestica Linn.

The following is a superficial description of the more important species likely to be met with by the farmer.

The Green Blowflies, sometimes known as Blue Bottles.

Lucilia cuprina (The Primary Green Blowfly).

This introduced insect is a bright, metallic green often with a coppery tinge; the eyes are red and the face and cheeks silvery white. The legs are black, with the exception of the thighs of the front pair, which are bright green. This feature is of particular importance as it distinguishes this species from the succeeding one.

The larva or maggot is smooth and cream-coloured; the puparium is smooth and barrel-shaped.

Lucilia sericata (The European Green Blowfly).

This fly is also an introduced species and very similar to the foregoing, but can be recognised by the fact that the thighs of the fore-legs are black like the other legs, and not green as in *L. cuprina*.

The other stages of the fly resemble very closely those of *L. cuprina*.

Chrysomyia rufifacies (The Secondary Green Blowfly).

This species is very similar in general appearance to the two preceding flies, and may easily be confused with them. It is, however, rather stouter in build and has a slightly bluish tinge on the abdomen. The most characteristic feature is a narrow dark band marking the posterior of each abdominal segment and giving the abdomen a faintly banded appearance.

The maggots are brownish-grey in colour and provided with fleshy outgrowths which have caused them to be popularly known as "hairy maggots" as opposed to the smooth larvae of the primary flies. The puparium is greyish brown and has a rugged exterior.

Microcalliphora varipes (The Small Green Blowfly).

This is a much smaller fly than the other green flies described and may further be distinguished by the legs which are banded black and light brown.

The maggots and pupae are smaller than those of *Chrysomyia rufifacies*.

The Brown Blowflies.

Two species of brown blowflies are commonly met with in Western Australia, both are primary flies with smooth, cream-coloured maggots.

Calliphora nociva (The Blue-tailed Blowfly).

This fly can be distinguished from the Western Australian brown blowfly by the yellowish-brown abdomen, the terminal and dorsal portions of which are occupied by a metallic, steel-blue patch.

Calliphora australis (The Western Australian Brown Blowfly).

This fly is sometimes called the Golden Winter Blowfly. It is a robust species characterised by the presence of golden yellow patches of fine hairs on the abdomen.

Relative Importance of Different Species.

Investigation has shown (Mackerras 1936) that *Lucilia cuprina* is by far the most serious sheep blowfly in Australia, approximately 80 per cent. of strikes being attributable to this insect; next important of the primaries in this State is *Calliphora nociva*, followed by *C. australis*.

The most important secondary species is *Chrysomyia rufifacies* which is of considerable economic importance on account of its ability to follow on a primary strike and further aggravate the wound.

Life History.

The eggs of the Primary Green Blowfly will hatch under favourable conditions in 12 to 24 hours (Mackerras 1936). The maggots feed up to six days and then may roam away from their food to pupate. This stage lasts about eight days following which the adult fly emerges and, under normal conditions, is ready to lay eggs in about another five days. Batches of eggs from 150-250 in number may be laid every few days for a period of over a month so that two or three thousand eggs can be laid by a single female.

Seasonal and Regional Incidence.

In the winter time most of the flies are dormant, the Calliphoras being the most active in the cold weather. With the advent of warmer conditions, the primary green flies appear and in the hotter months the secondary green blowfly is predominant. *Lucilia caprina* occurs throughout most of the farming and pastoral areas. The Calliphoras are typically southern in their distribution, although *C. nociva* has a more extensive range than *C. australis*.

Factors Inducing Strike.

One of the most important factors affecting fly strike is the weather. Warm and damp conditions are very favourable, as most sheepmen have learned to their cost, and it is because of this fact that such severe trouble has been experienced this season.

An area to be struck must be wet for some time and this accounts for the higher percentage of body strike during wet weather. In drought years fly strike is not serious with us and the majority of strikes are crutch and tail strikes where the wool has been wetted by urine, etc., but in wet years the back, loins, etc., may be sufficiently moist to induce strike and so we have a bad fly year. The abundance of green feed is also an important factor.

Prevention of Strike.

This may be attempted in two ways: naturally, that is by breeding non-susceptible sheep; or artificially, by treating the sheep in such a way as to render them unattractive to flies.

The first method is the one which is most desirable, but one which can only be done by degrees.

Seddon, Belschner and Mulhearn (1931) have demonstrated that wrinkly sheep are predisposed to fly strike and that such undesirable or C class sheep can in time be eliminated from a flock by culling. It has also been shown that yellow, greasy fleeces are undesirable from the point of view of fly strike as well as for other reasons.

Artificial Treatment.

The Mules Operation.—This is a quick way of converting C class or wrinkly breeched sheep into non-susceptible types.

The breech folds and any other distortions liable to cause contamination of the crutch are surgically removed.

This operation has much to recommend it, but it must be remembered that the resultant wounds are often liable to infection, and the practice should be

looked upon only as a temporary expedient and not one which can be used to supplant culling. It also has the disadvantage of making culling more difficult, as treated sheep may be confused with naturally non-susceptible types, and so kept for breeding.

Crutching.

This is probably the most effective and most widespread preventive measure in use. The wool should be shorn closely from above the tail, around the breech and down the back legs. A sheep in this condition is not attractive to flies and in some districts in addition to the usual crutching before lambing, an additional treatment may be given if a bad fly season is expected.

Jetting.

The most recent jetting fluid recommended is that used by R. N. McCulloch of the New South Wales Agricultural Department consisting of a calcium arsenite mixture (Annon 1939).

The method of preparing this mixture which is used at the rate of 10 lbs. of white arsenic, 10 lbs. of stone lime (calcium oxide), and 1 lb. of caustic soda to 100 gallons of water (10 : 10 : 1 : 100) is as follows:—

Place a four-gallon bucket full of water on a fire. Into another bucket weigh ½ lb. of caustic soda and secondly 4 lb. of white arsenic (arsenious oxide). Weigh out separately 4 lbs. of stone lime.

When the water is boiling, pour half the contents into the bucket of soda and arsenic, and place on the fire to continue dissolving the arsenic. Into the remaining water drop the stone lime lump by lump, and stir it as slaking takes place. Stand the slaked lime near the fire. When the arsenic-soda liquid is clear, but still boiling, lift from fire and pour into it a half bucket of boiling milk of lime. This should not be done too rapidly, as the ingredients react violently and may boil over. Place the mixture by the fire to simmer for 15 minutes.

This will make 40 gallons of 1 per cent. arsenic fluid for use.

The success of jetting depends largely upon the method of application. The object is to saturate the wool around the breech and to obtain this result pressure is necessary. Too high a pressure may produce skin injury, and treatment too soon after crutching is unwise due to the possibility of poison absorption by shear cuts, and the scant amount of wool present to absorb the fluid. The pressure required depends upon the growth of wool present, but varies from "about 100 lbs. per square inch on sheep with six weeks' wool to 130 to 150 lbs. for sheep carrying three to six months' wool." (Belschner, 1937.)

Trapping.

The efficiency of trapping as a control of blowflies was tested by the C.S. & I.R. both in New South Wales and in this State at "Cranmore Park," near Walebing. (Mackerras, Fuller, Austin & Lefroy, 1936.)

Two very similar areas were chosen at a suitable distance from one another and stocked with selected sheep. One area was intensively trapped and the other used as a control. Over a two-year period it could be shown that less strike was prevalent in the trapped paddock than in the untrapped, but whether this method is an economic proposition under normal pastoral conditions has still to be demonstrated.

The traps used were the Western Australian blowfly traps and it was found that the most attractive bait was liver to which was added about a pint of sodium sulphide liquid, mixed at the rate of three ounces of chemical to one gallon of water.

Wound Dressings.

A large number of mixtures have been advocated for treating strike wounds, but very few give results which can be regarded as at all satisfactory, and up to the present no lasting repellent has been found for incorporation in such dressings.

Mixtures advocated by the Joint Blowfly Committee are—

(i) 5 per cent. watery solution of zinc sulphate,
(ii) 5 per cent. watery solution of "Monsol,"
(iii) 4 per cent. phenol (carbolic) crystals in whale oil,

and the latest mixture evolved by the C.S. & I.R. is the glycerine-boric acid dressing prepared by dissolving 3 lbs. of boric (boracic) acid in 1 gallon of glycerine. (If the glycerine is warmed the process will be facilitated.)

To obtain the best results from any dressing it is necessary to shear all wool from around the wound and to make a careful examination to see that no small isolated pockets are overlooked. As many of the maggots as possible should be removed and the dressing thoroughly applied so as to reach all affected parts.

Disposal of Carcases.

Burning.—This method if thoroughly carried out is a most effective method of blowfly control, but it has the disadvantage of being laborious.

Burying.—Owing to the fact that primary maggots are able to emerge through up to 10 feet of soil, burying infested carcases is not an effective way of controlling blowflies, and as the secondary maggots are not able to penetrate the soil as easily as their smooth relatives, burying really favours the primary flies. This is undesirable when we realise that the secondary maggots will actually devour the primary maggots in a carcase and so assist in controlling the smooth-maggot flies.

If carcases are buried for sanitary reasons, they should also be poisoned.

Poisoning.—This is the easiest and most satisfactory method of treating carrion; a liberal sprinkling on both sides of a carcase with some arsenical powder, such as sheep dip, will successfully prevent the breeding of blowflies.

Biological Control.

Several attempts at controlling blowflies by parasites have been attempted by this Department, but without success.

A number of foreign wasps have been tried as well as a local species, but in no instances were encouraging results obtained. (Newman & Andrewartha, 1930.)

Summary.

1. Blowflies are divided into two main groups—primaries and secondaries.

2. Lucilia cuprina (the Primary Green Blowfly) is by far the most dangerous sheep blowfly.

3. Factors influencing the incidence of fly strike are weather conditions, the presence of green feed, and the type of sheep. Humid conditions, an abundance of green feed, and wrinkly or C class sheep are favourable to strike.

4. *Prevention of Strike.*—Strike may be minimised by—

(a) Breeding non-wrinkly sheep.
(b) Removing breech folds, etc., surgically (Mules operation).
(c) Crutching.

(d) Jetting with calcium arsenite (10 : 10 : 1 : 100).
(e) Application of suitable wound dressing.

5. *Carcase Disposal.*—This may be most effectively done by treatment with an arsenical powder such as sheep dip.

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NOTES ON SOIL EROSION IN THE NORTHERN AGRICULTURAL AREAS.

By L. J. H. TEAKLE.

At the request of the Mingenew Road Board and the Northern Zone Council of the Wheat and Wool Growers' Union of Western Australia, a reconnaissance of the Mingenew, Yandanooka, Carnamah, Perenjori and Morawa districts with respect to soil erosion was made in company with Mr. N. Davenport, the Agricultural Adviser for the district, during July, 1938. Lectures on soil erosion were given at various centres, and methods for the construction of contour banks for the control of soil erosion by water action were demonstrated at Yandanooka and Carnamah. In addition to general observations throughout the area, a detailed survey of the incidence of soil erosion was made on the property of Mr. J. A. Brown, "Raith," Yandanooka Lot 104, Yandanooka.

WATER EROSION.

Throughout the area, it was observed that water erosion was causing some damage where slopes in cleared land exceeded 3 to 3½ per cent. The erosion manifested itself largely in the form of gutters which interfere seriously with the working of the farms under modern methods. Sheet and rill erosion, while present and severe in some instances, were not extensive. The amount of land actually destroyed did not appear to be very large in the aggregate, but gutters cutting through the paddocks in undulating country and opening out on to the fertile flats, are most undesirable where big machinery is being used in the production of wheat.

Enquiries from many farmers showed that the first signs of soil erosion generally appeared within five to 10 years after clearing. In the first five years the physical properties of the soil are such that erosion does not occur to any extent even in very wet years. Following some years of cultivation, erosion develops rather rapidly and lands under fallow or newly sown wheat are most liable to damage during the early winter months.

Some measure of soil wastage as a result of water erosion is afforded by an estimate of the sediment carried by a small stream, which was made at Mingenew where the Lockier River was sampled on July 20th, 1938. At that time this stream carried about the normal winter flow estimated at 50 cubic feet per second. The water was quite muddy and an analysis showed that it carried 0.74 per cent. suspended matter, principally good red soil. This is equivalent to approximately 6.8 acre inches per 24 hours.

WIND EROSION.

In Western Australia wind erosion is generally most severe on light sandy soils. The more sandy types of sandplain country under cultivation suffer most severely, and sandy surfaced timber types may be damaged unless cultivated immediately after burning up is completed and care is taken to protect the surface in subsequent operations. In the Yandanooka area, however, where the farms are generally relatively small in area, wind erosion has become serious on the fertile flats, particularly during the years 1934-1937 inclusive. As a result of a period of low rainfall years with consequent reduction in feed production, serious overstocking has occurred. This has been accentuated by a grasshopper plague, and wind erosion has assumed damaging proportions on a number of farms. An improved system of management, involving a less severe programme of cultivation and lighter stocking, will be necessary in order to restrict the damage resulting from wind action.

A DETAILED SURVEY OF THE EFFECT OF WATER EROSION.

In order to obtain precise information concerning the incidence of soil erosion on an affected farm, a careful survey was made on the property of Mr. J. A. Brown, Yandanooka. This farm lies in the range of low hills along the western boundary of the Yandanooka valley. These hills are largely of Jurassic sandstone and conglomerate with out-crops of limestone.

From the sandstones are developed an attractive range of chocolate brown to brownish red soils of a sandy loam texture and with reddish clay subsoils. Patches of heavier textured soils, usually of a crabhole or gilgai formation, occur. These soils are eminently suited for wheat and sheep farming and have proved very productive. In general, it is observed that, in common with other Western Australian types derived from sedimentary rocks, they are somewhat

more prone to wind erosion than those of granitic origin, but do not appear any more liable to water action than are the granitic types. They may be regarded as quite typical of the better classes of soils in the red brown earth zone or jam-York gum belt of Western Australia.

The limestone occurs generally as cappings either on the hills or on the gentler slopes. The soils associated with the limestone are typically very stony and generally non-arable. Normally, these limestone areas afford quite good grazing and provide valuable shelter for stock when not cleared.

While situated in hilly country, about 75 per cent. of the area of this farm is undulating and quite suitable for arable farming as in these portions the slopes would seldom exceed 5 per cent. The remainder of the area, however, is either stony or steep. Slopes as high as 30 per cent. are encountered and 10 per cent. slopes are common. Topographically these hilly areas present a juvenile appearance with steep-sided gullies and grykes opening out into the flatter country.

In the virgin state this area carried principally jam (*Acacia acuminata*) and York gum (*Eucalyptus foecunda var. loxophleba*) timber, with curara (*Acacia* sp.) and needle bush (*Hakea* sp.) as undergrowth, and was quite well grassed. On the limestone ridges, jam and wattle (*Acacia* sp.) appear to have predominated and on the stony sandstone and conglomerate hills, sheoak (*Casuarina* sp.) and a variety of shrubs, including *Commersonia pulchella*, *Ruelingia luteiflora* and *Hemigenia Drummondii* are common. Flooded gum (*Eucalyptus rudis*) commonly occurs along the creeks.

The rainfall since 1922 is given in the following table:—

RAINFALL DATA FOR THE YANDANOOKA DISTRICT.

1922-1939.

Year.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1922	3	64	39	155	100	208	361	125	93	15	*Nil*	12	1,175
1923	52	98	10	165	137	809	298	155	184	41	*Nil*	*Nil*	1,949
1924	*Nil*	5	43	5	160	361	468	253	80	169	35	*Nil*	1,579
1925	146	14	*Nil*	*Nil*	278	451	257	93	232	46	10	68	1,595
1926	*Nil*	11	17	183	173	298	516	202	165	171	132	75	1,943
1927	*Nil*	23	407	33	175	345	453	199	186	21	2	120	1,964
1928	30	3	40	21	279	175	460	231	120	78	5	174	1,616
1929	*Nil*	58	25	7	415	536	205	207	48	18	131	1	1,651
1930	*Nil*	*Nil*	22	30	137	902	391	154	123	96	15	5	1,875
1931	*Nil*	*Nil*	41	57	517	187	465	212	209	68	253	46	2,055
1932	55	*Nil*	199	128	421	256	439	662	119	132	7	28	2,446
1933	11	17	71	19	314	614	253	391	99	129	46	36	2,000
1934	182	*Nil*	449	569	69	331	325	277	92	23	14	37	2,368
1935	151	71	137	196	68	111	487	309	91	51	3	6	1,681
1936	4	11	27	64	137	305	165	242	74	43	68	25	1,165
1937	8	11	2	205	334	285	44	243	119	18	21	14	1,304
1938	*Nil*	20	105	152	70	118	437	151	80	27	58	*Nil*	1,218
1939	124	176	1	11	280	....	....	....	....	....	....	....	...

It is quite adequate for mixed farming of the type practised in the red brown earth zone in Western Australia.

The Yandanooka area was subdivided for soldier settlement and this holding was taken up by Mr. Brown in 1922. Prior to subdivision, the Yandanooka Estate had attained a very high reputation for grazing value and cultivation had not been highly developed. With the influx of soldier settlers, extensive clearing operations were adopted and, in a few years, the bulk of the area had been cleared and was under cultivation. On account of the small size of the holdings, a fallow-wheat rotation, the most exhaustive of all possible rotations, was generally adopted and no effort was made to allow a period under pasture for the regeneration of the soils. Generally, the bulk of the timber was left on the rough limestone out-

crops, but on the areas of better soil the timber was removed in the course of the development of the farm. Even on very steep slopes, slopes in excess of 10 per cent. and too steep for the use of cultivating implements, clearing of timber was practically complete to promote the growth of pasture plants. Fig. 1 shows the steep slopes, practically devoid of timber and herbage, which are the starting point of several deep gullies in the south-eastern portion of the farm.

Fig. 1.—Steep slopes, practically devoid of timber and herbage, on the south-eastern portion of Yandanooka Lot 104, which are the starting point of several deep gullies which cut through valuable arable land on this farm and the property immediately eastward.

The first signs of water erosion on this property, in the form of gullies, were observed in 1927, about 5 years after clearing. Erosion was most severe during the winter on fallow and recently seeded land, and appears to be on the increase at the present time. In general, cultivation has been extended to slopes as high as 10 per cent. and it is in these and associated areas that the damage has been most severe.

Wind erosion has occurred fairly extensively during the summers of 1934 to 1937.

The survey of the damage resulting from water erosion was made by means of transects through the property and a clinometer was used for the measurement of the slopes. From the transects, the location of gutters and fences, the occurrence of hills and eroded areas were determined, and measurements made of the slopes representative of the farm.

The information has been plotted on a map which is represented in Fig. 2. Of the total area of 801 acres, 195 acres were found to be rough limestone country and steep slopes suitable only for grazing purposes; some 58 acres of the arable land had been seriously damaged by water erosion of the sheet type and the remainder, 548 acres, was still in quite good condition for wheat farming except for the inconvenience of dissection by gutters which had developed since clearing.

From general observations it was estimated that about half of the surface soil had been lost from the areas mapped as badly eroded. Examination of profiles indicated that little surface soil had been lost from the remainder of the arable land, but continued cultivation had damaged the soil structure and reduced powers

Fig. 2.—Sketch map of Yandanooka Lot 104 showing the disposition of rough limestone country and steep slopes and badly eroded arable land. Natural creeks, recently formed gutters, fences and slopes in per cent. fall are also shown.

of water absorption so that run-off was increased. Consequently, gutters had been cut in the lower portions of the undulations as the concentration of surface water moved into the main drainage channels.

FARMING EXPERIENCE.

Mr. Brown reports an average of about 20 bushels of wheat per acre over his cropped land until about the year 1933. During this early period of cropping yields of 25 bushels were obtained in the most favourable seasons. During the last five years, 1933-1937, the farm average has been only 14 bushels, with a maximum of 18 bushels. While such disabilities as rust and seasonal conditions may have contributed to this drop in wheat yield, Mr. Brown considers that it is probably largely due to the damage resulting from soil erosion.

Most likely the changes in the structure of the surface soil resulting from a heavy cropping programme are also contributory causes of reduced yields as well as increased run-off.

Prior to 1935, the property carried 500 sheep but, in later years, the flock has been reduced to 300. It is probable that the low rainfall of later years, as well as changed soil conditions, have interfered with normal pasture development and so necessitated the reduction in the number of sheep carried.

DISCUSSION.

Study of the information secured in the surveys shows that gullying appears to occur where cleared and cultivated slopes exceed 3 to 3½ per cent. and erosion, both of the gully and sheet types, is severe on cultivated land where the slope ranges from 6 to 10 per cent. Land steeper than 10 per cent. was not generally under cultivation.

Land deterioration has certainly occurred, due to a number of related causes including the exhaustive system of farm management adopted and heavy stocking, as well as to soil erosion. It is estimated that about 58 acres of otherwise valuable arable land has been seriously damaged by water erosion on this property. Probably more than 50 per cent. of the surface soil has been removed from these portions of the farm and, in addition, the paddocks, designed for the use of modern machinery, have been cut up into irregular pieces by deep gutters, the result of uncontrolled water movement. Not only are the farming operations interfered with, but the rush of waters from the eroding areas menaces the roads and necessitates the construction of expensive culverts to convey flood waters under the highways. Fig. 3 shows the large gutter cut on the south side of the main road as a result of flood waters from the eroded area in the south-eastern portion of Yandanooka Lot 104. It is to be observed that the soil is being eroded from the apron of the culvert and repairs are urgently needed if severe damage to the road formation is to be avoided in the future.

The acceleration of erosion by continued cultivation and the value of timber regeneration with the re-establishment of natural pastures is shown by a comparison of the situation on portion of the southern boundary of Yandanooka Lot 104 and the property adjoining on the south. Both areas were cleared about the year 1923 and water erosion became evident in 1927. Subsequently, cultivation was continued on this portion of Yandanooka Lot 104 but, on the other property, timber and herbage were allowed to regenerate naturally and cultivation was suspended. Figure 4 shows the condition on these portions of the two properties in 1938. Water erosion was almost completely arrested where regeneration was permitted, but increased rapidly under continued cultivation on Lot 104 (left). In consequence, in the south-eastern portion of Lot 104 are about 10 acres of badly eroded land which represents a loss to the farm and constitutes a menace to the

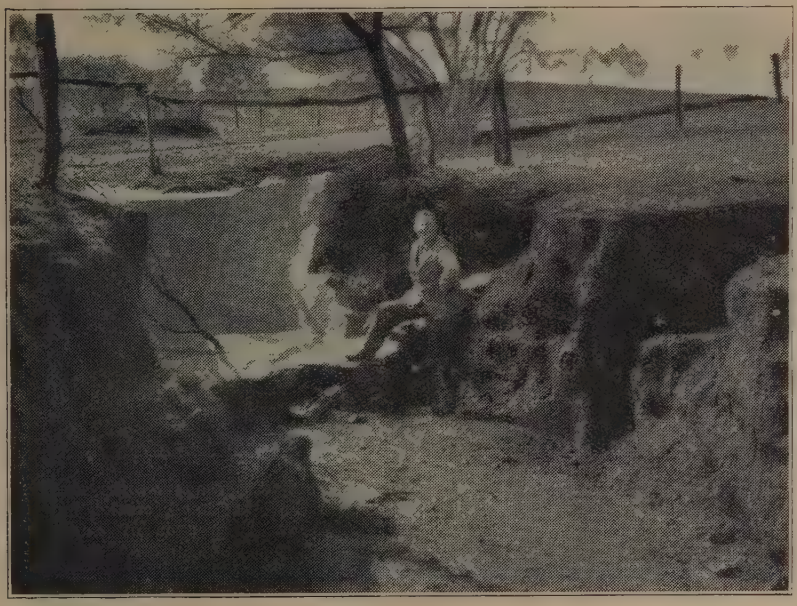

Fig. 3.—Large gutter formed by flood waters from the eroded area in the south-eastern portion of Yandanooka Lot 104. It is to be noted that the road formation is being menaced by the extension of the erosion in this gutter.

road. It is the wash from this area which has cut the large gutter shown in Fig. 3, and which may be seen through the fence in the timbered area in the right centre of Fig. 4.

It may be safely concluded that something over 10 per cent. of the arable area of this farm has been damaged by water erosion. This damage could have been largely avoided by the adoption of proper control measures in the first five years when the soil was practically in a virgin state and resistant to the forces of water erosion. If this arable land be valued at £5 per acre and the damage estimated at 50 per cent., the loss may be put down at £150. Had this sum been put into a five-year programme of erosion control at the outset, the problem would have been largely avoided and a permanent asset maintained, resulting in an annual increase of at least two or three bushels per acre of land cropped. The present situation is that the farm urgently needs a programme of contour bank construction which will now be much more costly on account of the damage already done. Furthermore, this action is the more urgently needed to arrest future increases in the damage done and to allow nature to repair the losses sustained.

The matter is not merely of interest to the individual farmer, but also the local governing bodies and to the State. The State suffers from land deterioration, road boards are faced with damage to road works, and the individual with loss of income and enhanced difficulties in farm management.

Action is being taken in this State by the Soil Conservation Committee, and the results of a State-wide questionnaire are now under consideration to assist, in some measure, evaluation of the situation in the agricultural areas. Similar enquir-

Fig. 4.—The natural regeneration of timber and herbage on the right has almost completely arrested water erosion. On the other hand, erosion has been accelerated by the continuance of cultivation on the portion of Yandanooka Lot 104 shown in the left portion of the picture.

ies are being undertaken in all States of the Commonwealth and it is hoped that the result will be concerted action by all parties interested to avoid the serious losses which have been reported from other countries.

ACKNOWLEDGMENTS.

Special acknowledgment is made of the assistance of Mr. J. A. Brown, of Yandanooka, in placing information at the disposal of the writer and in providing assistance in the carrying out of the work. The experience and advice of other farmers throughout the districts visited are very much appreciated, and thanks are tendered to Mr. N. Davenport for assistance in carrying out the survey and inspection.

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THE VALUE OF SHEEP CLASSING AND MATING.

Hugh McCallum, Sheep and Wool Inspector.

The improvement that has taken place in the flocks of Western Australia of late years is the result of thorough and systematic sheep classing. Better flocks mean bigger returns, and every sheep owner is recommended to class the flock before shearing. The sheep are then carrying full evidence of their value as producers of wool.

Sheep classing means grading the animals that are similar to each other in quality, whether good or bad, into different flocks. In order to class a flock satisfactorily, it is essential that the farmer should examine each sheep individually. To be a thoroughly efficient classer, it is necessary for one to understand and be able to recognise the various qualities and types of wool.

If the flocks are not classed, the undesirable units will retard their improvement. The sheep will soon deteriorate and will grow very little good quality wool. Many farmers do not class their flocks and in consequence they do not receive the returns compared with the man who does class his flock.

The percentage of inferior sheep to be culled from the flock will depend upon the standard of excellence set in the flock. Having fixed a certain ideal to work on, the classer should have in his mind the perfect sheep, and reject any faulty sheep or those of a type other than the sheep the farmer wishes to breed.

Constitution is the foundation of a flock. Aim at breeding a sheep as big as is consistent with the natural conditions prevailing in the various districts of the State. The modern sheep of to-day are plain bodied, with a fair front and open face, broad, well-built animals showing plenty of bone, strong head, with neck of the correct proportion, thick and well set on the shoulders, straight back, ribs well sprung, chest wide, withers and rump well rounded and legs set well apart.

Classing does not only serve to get rid of the unprofitable sheep, but to prevent them from breeding and so perpetuate their weaknesses in the flock. By classing consistently every year the inferior sheep are culled and the source of many weaknesses in breeding is removed. Where the sheep are classed before shearing the farmer knows exactly what the faults are. Therefore, it pays to class and keep on classing yearly for perfection and type.

Only one aspect of this important work has been dealt with, that of discarding the inferior sheep and retaining only the better class sheep to reproduce themselves. There is, however, another reason for sheep classing. It is by this means that it is possible to exercise a certain control over future generations. This control is based on two well-known laws of nature, namely, the law of "like begets like" and the law of variation.

By the first-named law, it is known that within certain limitations the parent will beget progeny resembling themselves so that by classing ewes having certain faults as well as good points in common, the faults can be neutralised in their progeny by selecting rams that are exceptionally strong in those particular qualities in which the ewes are weak. In this manner the good points of both parents supplement each other in the offspring, producing a progeny better than the parents. Generally when the same characteristic is present in both parents it will be intensified in the progeny. This should be borne in mind at mating time, as it is in this manner possible to fix and accentuate a very undesirable characteristic.

There is also the law of variation where like produces unlike. Often both a high-class sire and ewe will produce a very inferior sheep; in fact, a freak. Improvement in sheep breeding by classing is a gradual process extending over

a considerable period, and it is only by following on the lines indicated that the farmer can hope to be successful and thus raise the standard of sheep breeding.

Many flocks have been ruined by introducing fresh strains or types quite unsuitable for the purpose. Grade ewes are very necessary. High-class sires could not reasonably be expected to give the best results from undesirable ewes in flocks that are not classed or culled yearly. Many breeders expect to remedy every defect in one generation. It is not possible to eliminate all the defects at the same time, because any given characteristic cannot be fixed in one generation. The value of flock improvement by careful selection and mating is dependent upon potency. The value of same can be determined by contrast of the improved and unimproved flocks.

The prepotency of individual sheep can be judged only from a knowledge of their progeny. Regarding mating, here you have the greatest problem to solve, and as every sheepbreeder is not gifted with that knowledge of what to mate and what not to mate, the following remarks may help to some extent.

To join extremes in any way only means breeding undesirable sheep, and if a medium between two extremes is necessary, it can only be obtained with safety by working up from one extreme and down from the other. Remember, there is no short way in sheep breeding; it is work that requires patience and constant study.

The object of the farmer should be to breed the best only and make adequate provision for reserves of feed. To feed the flock judiciously should be the first duty of every breeder; it means a greater measure of prosperity.

The production of quality wool is the paramount factor in sheep breeding. We breed some wonderful sheep that grow about as much wool as possible and of a quality that makes top price per pound and return per head, but many farmers breed sheep that are not worth feeding. Why? This is the result of a breeder not being watchful enough to realise that his sheep have gone back through using the wrong type of rams. The owner has not noticed the drift, for the reason that it has been gradual. How are they bred? It would be hard to state the reason, for they were never cared for or culled; just allowed to breed anyhow, year in and year out; inferior rams of many types were used. Therefore, in the purchase of rams it should always be remembered that the best is generally the cheapest and will, in the long run, make more actual profit than the cheaper animals.

THE NEED FOR UNIFORMITY IN WOOL.

As sheep exercise the dual function of wool and mutton producers, more attention should be given by farmers to both of these products. Even when prices are low, there is always a greater demand and higher price paid for quality wool. This type of wool costs no more to produce than inferior wool. The most essential points in the fleeces are uniformity of length, evenness in quality, and freedom from kemp hairs or coarse wool. The reputation of any flock depends on the appearance of the clips on the show floor. If the clip is uniform it can generally be taken as an accepted fact that careful management and selection are exercised, but when the contrary is the case it shows that the flock cannot be depended on to produce a uniform result to the grower. Therefore, quality wool cannot be grown on sheep of indiscriminate breeds.

Quality in wool means that the wool has all the characteristics required to give the highest spinning capacity possible for its degree of fineness. Having obtained length, density is next introduced, taking care all the time to maintain the length. This can only be done by selecting rams with length and density combined. Therefore, the rams used on the new generation should be better,

though they will perhaps be more expensive than those used on the original flock. Such progress should be continued every year and the remaining defects eliminated and that which is gained should be retained and, if possible, fixed until eventually the general standard is raised.

The benefits of judicious yearly classing may be summed up as follows:—It prevents inferior animals from breeding and raises the standard of the flock. It supplies the source of knowledge required for selecting the correct type of rams. It enables the breeder to ascertain whether the rams he has selected are giving good results. It enables the breeder to grow the correct type of wool. It enables the breeder to work towards a definite object. It makes wool classing easier and more satisfactory, and above all, the farm is made more productive.

In conclusion, I may state that with the ever-growing competition for wool from artificial fibres, it will be necessary for wool growers to produce the best and nothing but the best, and this can only be obtained by systematic selection and breeding. At present the name of Australia stands supreme throughout the world as a fine-wool producing country, and every Australian sheep breeder should make it his business to further this reputation by carefully classing his sheep.

THE FRUIT INDUSTRY IN WESTERN AUSTRALIA.

Geo. W. Wickens,
Superintendent of Horticulture.

ACREAGE, PRODUCTION AND EXPORT.

From figures quoted in the returns given hereunder it will be noted that for the first time in many years the area under apple trees has failed to make an annual increase, the total acreage in 1936-37 being 13,031, and in 1937-38 (latest figures available) 12,933, a reduction of 98 acres. To find a similar occurrence it is necessary to go back to seasons 1923-24 and 1924-25, when there was a reduction of 155 acres, from 9,672 in the former season to 9,517 in the latter. In the twelve seasons following there was a regular annual increase, aggregating in season 1936-37 to 3,416 acres.

Though the reduction of 98 acres from season 1936-37 to season 1937-38 is comparatively small it gives rise to the surmise that perhaps apple growers in Western Australia are at last heeding the many warnings of over-production that have been voiced during recent years, and have eased up in their planting activities. It will be noted that the reduction quoted has occurred in the unproductive area, the productive area having increased by 252 acres and the unproductive decreased by 350 acres.

In season 1938-39 the crop produced created an all time record, both in total number of cases and in production per acre of bearing trees. Actual figures relating either to acreage or production will not be known until later in the year, but is is shown later in this article that the export figures *plus* local consumption, say, 450,000 cases, are convincing evidence of a yield in 1938-39 amounting to at least 1,811,295 cases, and it is a fair assumption that the bearing area has increased from 9,738 acres in 1937-38 to 10,000 acres in 1938-39, which means an average production throughout the State of 181 cases per acre, a figure that has never even been approached before, the nearest being in season 1928-29, with 148 cases per acre. Not all this bountiful yield can be credited to the favourable weather conditions, quite a lot being due to better and more scientific husbandry on the part of growers.

One interesting feature has come to light in the export figures, which shows how the varieties grown have changed in the last ten to fifteen years. Once "Jonathan" held pride of place, now "Granny Smith," which twenty years ago was only planted in a few orchards, heads the list.

The following table shows the acreage (productive and unproductive) and production of all kinds of fruit trees in Western Australia for season 1937-38, with figures for 1936-37 in parentheses:—

WESTERN AUSTRALIA.

ACREAGE AND PRODUCTION OF FRUIT IN WESTERN AUSTRALIA.

Season 1937-38 (with figures for 1936-37 in parentheses).

ORCHARDS.

Kind of Fruit.	Area.						Production.	
	Productive.		Unproductive.		Total.			
	acres.		acres.		acres.			
Oranges	2,582	(2,608)	471	(450)	3,053	(3,058)	304,852 bus.	(302,235) bus.
Mandarins	132	(139)	36	(41)	168	(180)	14,429 ,,	(14,981) ,,
Lemons	436	(426)	70	(73)	506	(499)	63,904 ,,	(63,685) ,,
Other Citrus	21	(18)	27	(27)	48	(45)	2,264 ,,	(1,677) ,,
Apples	9,738	(9,486)	3,195	(3,545)	12,933	(13,031)	930,678 ,,	(1,045,369) ,,
Pears	854	(864)	175	(166)	1,029	(1,030)	93,922 ,,	(101,472) ,,
Quinces	79	(85)	14	(15)	93	(100)	7,381 ,,	(8,620) ,,
Apricots	593	(607)	90	(95)	683	(702)	61,388 ,,	(63,668) ,,
Peaches	651	(643)	214	(221)	865	(864)	62,261 ,,	(67,373) ,,
Nectarines	165	(161)	71	(64)	236	(225)	15,869 ,,	(17,175) ,,
Plums	849	(862)	258	(274)	1,107	(1,136)	71,975 ,,	(86,593) ,,
Bananas	141	(164)	104	(85)	245	(249)	26,504 ,,	(30,151) ,,
Cherries	30	(28)	25	(22)	55	(50)	26,296 lbs.	(46,950) lbs.
Almonds	297	(283)	52	(74)	349	(357)	62,733 ,,	(71,805) ,,
Figs	345	(338)	62	(60)	407	(398)	37,807 bus.	(39,375) bus.
Strawberries	28	(33)	....	....	28	(33)	50,240 pun.	(51,468) pun.
Passion Vines	68	(51)	....	....	68	(51)	8,128 bus.	(5,804) bus.
Pineapples	8	(10)	3	(5)	11	(15)	1,421 No.	(9,981) No.
Other Fruit	53	(73)	34	(33)	87	(106)	..	
Small Fruit	4	(12)	....	....	4	(12)		
Total	17,074	(16,891)	4,901	(5,250)	21,975	(22,141)		

VINEYARDS.

	Area.		Production.	
	acres.		cwt.	
Table Grapes	1,045	(1,038)	58,350	(58,393)
Wine Grapes	1,608	(1,613)	48,112	(42,564)
Drying Grapes	2,524	(2,474)	195,415	(195,920)
Not Bearing Vines	1,031	(980)	...	...
Totals	6,208	(6,105)	301,877	(296,877)

Wine made from 1937-38 *Season's Grape Crop*—

	gallons.	
Beverage Wine Fortified	107,271	(86,627)
Beverage Wine Unfortified	201,678	(145,339)
Distillation Wine	79,129	(116,994)

Dried Fruit made from 1937-38 *Season's Grape Crop*—

	lbs.	
Raisins	607,012	(721,675)
Sultanas	1,016,222	(861,829)
Currants	4,227,388	(4,226,821)

Figures relating to acreage and production of vineyards, season 1937-38, are also given in above table.

EXPORT.

Apples.

It was fortunate indeed for Western Australia that in this year of high production her overseas markets for apples were not restricted by quotas, and regrettable as were the misfortunes experienced by Eastern States orchardists owing to drought and bush fires, they proved the salvation of the Western State's apple growers. The total quantity of apples actually shipped overseas from 1st January, 1939, to 30th June, 1939, amounted to 1,289,537 cases, and in July an additional 43,145 cases were sent abroad; also to the end of June, 28,610 cases were sent to the Eastern States, making a grand total of 1,361,292 cases: greater by over 400,000 cases than the previous record in 1936; in fact, greater by 25,446 cases than the total quantity actually produced in any previous season.

The export season just ended is the first in which details of varieties of apples shipped have been recorded, and the information is both interesting and useful. It shows that out of 32 varieties sent to overseas markets seven are responsible for 95 per cent. of the total shipments, "Granny Smith" heading the list with 329,460 cases and "Scarlet" at the bottom with two. Quantities of each are as follow:—

	cases.
Granny Smith	329,460
Cleopatra	303,452
Dunns	216,274
Jonathans	191,590
Yates	107,364
Rokewood	50,121
Doherty	26,418
Rome Beauty	16,989
Statesman	11,611
Delicious	9,908
Democrat	8,785
Nickajack	7,780
Sturmer	3,865
King David	1,474
Ballarat	1,064
Cox's Orange Pippin	789
Stayman	554
Pioneer	508
Stone Pippin	468
Newtown Pippin	316
Ribston Pippin	302
White Winter Pearmain	203
Gravenstein	66
Shorland Queen	43
London Pippin	38
Strawberry Pippin	34
Granny Mac	22
King Cole	12
French Crab	9
Reinette du Canada	9
Pomme de Neige	7
Scarlet	2
Total	1,289,537

PEARS.

Pears also produced a record crop, with record shipments. Production figures are not yet available, but the quantity exported from 1st January to 30th June, 1939, amounted to 67,041 cases, the previous largest export total being in season 1932-33 when 46,986 cases were sent away. Twenty varieties are included in the list and it is a coincidence that, similar to apples, seven varieties made up 95 per cent. of the total. Details of the number of each are as follow:—

	cases.
Josephine	22,616
Winter Nelis	13,481
Beurre Bose	8,367
Packham	8,253
Comice	8,112
Glou Morceau	3,031
Winter Cole	942
Keiffer	776
Winter Bartlett	529
Vicar	525
Beurre d'Anjou	202
Bartlett	50
La Conte	44
Howell	35
Duchess d'Angoulene	22
P. Barry	15
Garber	14
Madam Cole	13
Beurre Clairgeau	10
Broom Park	4
	67,041

GRAPES.

Grapes were responsible for another export record in 1938-39, the quantity of fresh grapes sent away amounting to 84,765 cases; the previous record being in season 1937-38 with 72,752 cases.

QUANTITIES AND KINDS OF FRUITS EXPORTED.

The following table shows quantities of each kind of fruit exported for year ended 30th June, 1939, and the destinations to which the fruit was shipped. In the period covered some fruit was exported during the first half, from 1st July to 31st December, 1938; in fact, nearly all the oranges were sent away in 1938.

Kinds of fruit and quantities in cases, July to December, 1938, were—

	cases.
Apples	11,758
Oranges	2,457
Grapes	5
Grape Fruit	48
Lemons	15
Tomatoes	10
Peaches	40
Plums	61

The total quantity of fruit exported for year ended 30th June, 1939, constitutes a record for the State—1,457,467 cases. The previous record was in 1936 with 1,010,920 cases.

EXPORT OF FRESH FRUIT FROM WESTERN AUSTRALIA TO OVERSEAS PORTS FOR YEAR ENDING 30TH JUNE, 1939.

Destination.	Apples.	Pears.	Oranges.	Grapes.	Grape Fruit.	Lemons.	Tomatoes.	Peaches.	Plums.	Passion Fruit.	Melons.	Totals.
	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.
London	510,366	49,456	2	11,525	....	....	....	1	....	17	....	571,367
Hull	23,082	....	....	....	....	....	....	....	....	....	....	23,082
Liverpool	146,613	....	....	....	....	....	....	....	....	....	....	146,613
Newcastle	13,201	....	....	....	....	....	....	....	....	....	....	13,201
Glasgow	154,117	....	....	502	....	....	....	....	....			154,619
Southampton	52,644	....	....	1,346	....	....	....	....	....			53,990
Hamburg	130,240	2,836	....	2,175	....	....	....	....	....			135,251
Stockholm	139,679	13,097	....	2,473	....	....	....	....	....			155,249
Rotterdam	20,457	....	....	....	....	....	....	....	....			20,457
Singapore	51,489	1,209	2,476	23,345	2	221	10	225½	769½	2	26	79,775
Penang	3,802	....	143	2,272	....	....	....	1½	34	....		6,252½
Batavia	4,292	70	5	2,615	....	....	....	....	71	....		7,053
Belewan	1,796	5	4	311	....	....	....	....	....			2,116
Sourabaya	2,887	118	....	1,563	....	....	....	10½	48½			4,627
Bangkok	1,255	....	....	1,424	....	....	....	....	....	....		2,679
Samarang	2,126	40	....	1,333	....	....	....	....	10	....		3,509
Palembang	100	....	....	14	....	....	....	....	....	....		114
Saigon	337	....	25	620	1	1	....	....	....	....		984
Rangoon	511	15	....	3,137	....	....	....	....	22¼	....		3,685½
Malta	1,264	....	....	....	....	....	....	....	....			1,264
Colombo	10,756	10	20	25,445	25	....	....	3	1			36,260
Port Said	23,113	85	....	2,248	....	....	....	....	28	....		25,474
Bombay	3,337	....	....	650	....	....	....	....	....	....		3,987
Aden	1,260	....	60	....	....	....	....	....	....			1,320
Mauritius	50	....	....	20	....	....	....	....	....	....		70
Calcutta	379	90	50	1,166	10	....	....	....	....	....		1,695
Madras	2,142	10	30	581	10	....	....	....	....	....		2,773
Totals	1,301,295	67,041	2,815	84,765	48	222	10	241½	984½	19	26	1,457,467

IMPORTATION OF FRUIT TREES AND PLANTS

Apple and orange trees bulk largely in the number of fruit trees brought into Western Australia from the Eastern States, and, as a matter of fact, the great majority of trees planted are propagated in the East. Particulars showing numbers of all kinds of trees and plants are shown in the following table:—

PLANT DISEASES ACT, 1914.

Return of Fruit Trees and Plants inspected at the Ports of Fremantle and Albany for Year ended 30th June, 1939.

Kind of Trees.	Fremantle.	Albany.	Total.
	No.	No.	No.
Apple	28,640	8,486	37,126
Apricot	1,781	246	2,027
Almond	4,711	502	5,213
Cherry	884	179	1,063
Fig	64	22	86
Lemon	3,620	3	3,623
Loquat	471	4	475
Mulberry	386	6	392
Nectarine	1,522	310	1,832
Mandarin	1,306	...	1,306
Orange	17,530	3	17,533
Grape Fruit	2,928	2	2,930
Cumquat	130	...	130

PLANT DISEASES ACT, 1914—(*continued*).

Return of Fruit Trees and Plants Inspected, etc.—(continued).

Kind of Trees.	Fremantle.	Albany.	Total.
Peach	7,321	434	7,755
Persimmon	88	6	94
Pear	4,687	226	4,913
Plum	3,807	400	4,207
Quince	290	11	301
Banana suckers	3,500	...	3,500
Walnut	160	39	199
Chestnut	20	2	22
Other nut	555	8	563
Olive	19	6	25
Tung Oil	9,900	324	10,224
Guava	...	3	3
Currant	250	12	262
Gooseberry	329	28	357
Loganberry	173	12	185
Raspberry	195	12	207
Strawberry	10,838	...	10,838
Apple stocks	22,000	...	22,000
Peach stocks	10,510	...	10,510
Pear stocks	2,000	...	2,000
Palm seed	(bags) 3	...	(bags) 3
Ornamental	20,270	1,129	21,399
Bulbs and Roots	411,113	212	411,325
Totals	571,998 + 3 bags	12,627	584,625 + 3 bags

In the returns showing quantities of fresh fruit brought over from the Eastern States it will be noted that oranges, bananas, cherries and pineapples are most in evidence. Details are as under:—

IMPORTATION OF FRESH FRUIT INSPECTED UNDER THE PLANT DISEASES ACT, 1914, FOR YEAR ENDED 30TH JUNE, 1939.

Kalgoorlie—

Bananas	2,930	crates
Pineapples	132	„
Nuts	115	bags
Oranges	6,634	cases
Lemons	144	„
Passion Fruit	16½	„
Tomatoes	379	„
Grape Fruit	25	„
Coconuts	1	bag
Persimmons	1	case
Olives	1	„
Peaches	279	cases
Plums	188½	„
Nectarines	88½	„
Cherries	460	„
Apricots	24½	„
Gooseberries	10½	„
Loquats	1½	„
Mandarins	146	„
Strawberries	5	„
		11,582 packages

IMPORTATION OF FRESH FRUIT INSPECTED, ETC.—(*continued*).

Fremantle—			
Bananas	128 crates		
Pineapples	1,907 ,,		
Nuts	8,860 bags		
Oranges	243 cases		
Passion Fruit	10 ,,		
Grape Fruit	20 ,,		
Cherries	2,211½ ,,		
Gooseberries	151½ ,,		
			13,531 packages
Albany—			
Bananas	4 crates		
Pineapples	3 ,,		
Nuts	*nil*		
Oranges	63 cases		
Grape Fruit	3 ,,		
Coconuts	½ bag		
			73½ packages
Carnarvon—			
Nil	*nil*	*nil*	
Total			25,186½ packages

The figures giving quantities and kinds of fruit imported from overseas show there is still room for more home grown bananas in the local markets, no less a quantity than 56,877 crates having been imported during the year ended 30th June, 1939. Details are as follow:—

IMPORTATION OF FRESH FRUIT UNDER THE QUARANTINE ACT FOR YEAR ENDED 30TH JUNE, 1939.

	lbs.
Bananas	4,550,206
Pineapples	377
Mangoes	770
Mangosteens	720
Grape Fruit	10,025
Coconuts	162,226
Nuts	65,769
Total	4,790,093

SPECIMENS FOR LABORATORY DIAGNOSIS OF DISEASES IN STOCK.

Laboratory facilities for the accurate diagnosis of disease in all classes of stock, including poultry, exist at the Veterinary Branch, Department of Agriculture, Perth, and while many avail themselves of this service, there are others who are apparently unaware of its existence. Moreover, of those who do forward specimens and samples, very few follow out the correct methods, and quite a number received are of little value. The Veterinary Pathologist is always desirous of receiving specimens associated with mortality or disease in stock. In this way much valuable information regarding the diseases actually present in the State can be arrived at and a report for the individual farmer provided.

Care must be exercised to select specimens which enable the Pathologist to be of real assistance and the value of a laboratory diagnosis is limited by the character of the specimen and its state of preservation on arrival. Contaminated or putrefied specimens are of little or no value for diagnosis. It is hoped that many more people will take the advantage of the service available and that these

notes will assist them to send suitable material in a satisfactory state for examination.

A covering letter should accompany all specimens forwarded; on occasions samples have been received without even the owner's name and address. The following particulars are required:—

i. Name and address.
ii. Date.
iii. Age, breed, sex of animal or animals affected.
iv. Number in affected group.
v. Number lost.
vi. Number sick.
vii. When disease commenced.
viii. Symptoms noticed.
ix. Any treatment adopted.
x. General information on feeding, state of pastures, management.

Generally the organs of value are the lungs, heart, liver, spleen (melt), kidney and intestines. If, however, the main changes were associated with say the bladder or tongue that should be forwarded. Organs should be immediately placed in a very clean jar and covered with a 4 per cent. solution of formalin. Intestines should be placed in a separate bottle to other organs. Placing of tissues in formalin, of course, renders them useless to examine for bacteria (germs) in cases of infectious disease. For this purpose a glass jar should be boiled, together with the lid, and on cooling, portion of the organ placed therein without allowing dirt or other extraneous matter to enter. Specimens should always be despatched to the laboratory as quickly as possible.

With sheep it is preferable when possible to bring an affected animal to the laboratory and, in the case of poultry, where such is reasonably easy, birds should always be forwarded unopened. With poultry too, it is more desirable to send a typically sick bird than a dead one. For chickens, six at least are preferred, when a disease outbreak occurs.

Parasites.

Worms, etc., should never be placed in commercial methylated spirit if this can be avoided; 70 per cent. alcohol is much better.

Examination of the droppings of animals and birds enables the Pathologist to give a report of the type of worm present and the severity of infestation. Droppings should be gathered freshly passed and placed in a tin. They too, should be sent immediately as they are of little value when quite dry.

Milk Samples.

Strict cleanliness is essential when collecting and forwarding milk. The bottle should be thoroughly clean, the first few jets of milk discarded and the bottle filled without any dust or dirt contaminating it. A pinch of boracic acid should be added for preservation.

Milk is examined for the presence of mastitis and tuberculosis of the udder.

Blood Samples.

These are necessary for examination for contagious abortion of cattle and those requiring a diagnosis of this disease are issued with a special circular on the method of collection and transport.

Specimens should be addressed, Veterinary Pathologist, Department of Agriculture, Perth, and, to comply with Commonwealth regulations, should be sent by registered post.

PULLORUM DISEASE OF CHICKENS.

L. W. Mahaffey, Assistant Veterinary Pathologist.

Pullorum disease, which is prevalent in most countries of the world, is mainly a disease of very young chickens, few cases of fatal infections having been recorded in adult birds. However, the first indication of the presence of this disease in Western Australia was provided in 1935 when nearly 400 birds aged 10 to 12 months died from an infection subsequently diagnosed as Pullorum disease. Remarkably enough, no outbreaks of Pullorum disease in this State have previously been described in chickens. This is considered due to the lack of opportunity on the part of the Veterinary Pathologist, in the past, to examine chickens, rather than to the non-existence of the disease. The causative bacterium has been known here definitely since 1935, at least, and probably has been present much longer. The first outbreak in chickens to be definitely diagnosed occurred this year; on one farm over 3,000 died.

Cause.

Pullorum disease, formerly known as bacillary white diarrhoea, is caused by a specific germ known to bacteriologists as *Salmonella pullorum*. It attacks *very* young chickens of any breed or sex, although the mortality rate is higher amongst the heavy breeds, in which over 90 per cent. may die. In any breed, however, very high mortality is to be expected when the disease makes its appearance.

Symptoms.

Symptoms are observed very early in life and deaths may commence on the second day but rarely later than the fifth day after hatching. Consequently, when chickens commence to die in considerable numbers, within the the first week after hatching, the farmer may always suspect Pullorum disease. Faulty brooding methods and management may also cause substantial losses and a ready differentiation of the two conditions can be made only in the laboratory at the Veterinary Branch, Department of Agriculture, Perth. Chickens may, in some cases, be just found dead under the brooder. Others separate themselves from their fellows, appear very dull and listless with drooping wings, and do not feed or drink. In a number of cases a white diarrhoea is noticed which frequently pastes up the vent and interferes with the subsequent passages of the droppings. Not all infected chickens die. Those that manage to survive an outbreak for three or four weeks usually grow up apparently healthy but they very frequently become "carriers" and as well as being very poor layers, these constitute a constant menace in the future.

Post Mortem Appearance.

On opening a chicken which has died of Pullorum disease, in many instances, nothing abnormal may be seen. In some, however, any combination of the following abnormalities will be revealed:—

(a) Dark spots in the lungs, which are normally a pale pink colour; yellowish nodules may also be present.

(b) Enlarged liver with or without small pin point nodules visible on its exterior.

(c) Sometimes yellowish nodules on the heart.

Cure.

There is no known cure for the condition. The germ is present in all organs and tissues of the body.

Perpetuation of the Disease.

The chicken which becomes infected but does not die is the danger. It reaches adult age and commences egg production. In the adult carrier the germ remains localised in the ovary and is present in the egg when laid. Such birds are always poor layers and many, but not all of their eggs are infertile. If a fertile egg is incubated with a batch of healthy eggs the danger of the latter becoming infected after hatching is very real. A chicken hatching from an infected egg spreads the germ in the incubator and thus infects many of its fellows before being placed in the brooder. In the brooder, sick chicks pass the germs in the dropping, contaminate the ground and surroundings and provide the means for further infection of those which were possibly free of the disease on leaving the incubator. Only a few infected eggs amongst a thousand or two in an incubator are necessary to cause an outbreak of Pullorum disease.

Control.

First an accurate diagnosis is essential. Therefore, whenever an outbreak of disease or mortality occurs amongst chickens, farmers should communicate with the Veterinary Branch, Department of Agriculture, Perth, and forward or bring six chicks to the laboratory. For preference some at least should be alive and showing typical symptoms.

Since the adult "carrier" birds constitute the source of danger, steps should be taken to eliminate these. This may be done by a blood test of all birds on the property, when those shown to be carriers are separated and disposed of for table purposes as quickly as possible. The Veterinary Branch arranges for the testing if necessary. If mortality amongst chicks has reached 90 per cent. it is better to kill all survivors after a diagnosis is established rather than to allow them to grow up, since they are a constant source of worry then. In all cases runs which have been occupied by infected chicks should be dug over and thoroughly disinfected with lime, and fittings should be sprayed with 5 per cent. Izal or other similar disinfectant. The adult stock shown negative by the test are placed in a clean run separated from the positives, which are to be disposed of and yards previously occupied ploughed or dug over and disinfected.

Incubators should be fumigated before use with formaldehyde gas which is quite efficient and simply produced from the action of formalin on Condy's crystals. Three times during incubation the same procedure should be adopted and this is quite harmless to the developing eggs. The method will be explained to anyone on application.

Conclusion.

It must be emphasised that Pullorum disease is a very destructive and serious disease and anyone having any cause to suspect its presence should immediately communicate with the Department's Veterinary Branch or send chickens to the Veterinary Pathologist. In addition there are other diseases of poultry which may take a heavy toll and it is hoped that farmers will take advantage of the service available to them at the laboratory, Perth, and forward diseased poultry to the Veterinary Pathologist, Department of Agriculture, for examination, which will enable an accurate diagnosis to be made.

GIANT STAR GRASS.

C. A. Gardner, Government Botanist.

An expedition sent last year by the Government of the Union of South Africa to East and Central Africa for the purpose of collecting grasses which might prove of value in South Africa, returned with specimens of a remarkable species of *Cynodon* which they encountered in various parts of Tanganyika, Kenya, Uganda, and the eastern parts of the Belgian Congo. This grass, which apparently includes more than one strain of *Cynodon plectostachyum* (K. Schum.) Pilger, is claimed to be a remarkable species because of its astonishing rapidity of growth, its valuable forage properties, and its value as a soil binder in soil erosion. The grass, originally described as a *Leptochloa* by Schum in 1895 was known to be indigenous in Central and Eastern Africa, and is therefore not new to science.

There have been several reports in the Press recently in connection with this grass, but in the absence of its systematic identity it has not been possible to make any statements as to its value in this country. The genus Cynodon comprises several species indigenous in Africa, India and Australia, the most common species being *Cynodon dactylon* (Linn.) Pers., the "Couch grass" of our lawns and pastures, and the "Bermuda grass" of America, where it has long been introduced. Unlike the Couch grass, this newly rediscovered grass attains a height of from three to four feet, and spreads to an unusual width.

Writing in "Nature" (July, 1939), Dr. Pole Evans says: "Apart from its luscious and dense stand, often three to four feet in height, the most remarkable character of the plant in the veld was its amazing network of robust runners (stolons), and it was at once realised that in this plant Nature has provided us with valuable material for erosion control. Living material was brought to Pretoria and was planted out under conditions where the growth of the plant could be studied in detail. The plants have been under observation for some five and a half months, and during this period, under a rainfall of 27.49 inches they have made remarkable growth . . . Individual plants during this time have covered more than eight thousand square feet of soil, and in many instances have put out runners (with offshoots) from the parent plant, measuring in length more than fifty feet! These runners and offshoots, of course, anchor themselves down firmly at almost every node. The material offers great possibilities for erosion control in areas where this grass can be successfully established."

It will be noted that the habitat of the plant is tropical Africa, and that experiments are in progress in Pretoria, where there are indications of success. Pretoria lies in Lat. 35deg. 47 minutes south, *i.e.*, slightly further south than Carnarvon. The rainfall there is about 27 inches, which falls almost entirely in the summer (October to April) the winter rainfall (May to September) averaging slightly less than two inches. The extreme temperatures are much the same as those of South Western Australia, the winter and summer mean temperatures about 80 degrees and 70 degrees respectively. The seasonal incidence of the rainfall is, however, quite reversed. It is evident that this grass, like so many other warm climate grasses, makes its active growth during the summer, and for this reason it is scarcely to be expected that it will be suited to the conditions in South Western Australia. On the other hand, there is every possibility that the grass might prove eminently successful in the north of Western Australia, especially in the alluvial plains of Kimberley and the De Grey River. Efforts will be made to secure both runners and seeds early in the coming year, when they should be available for distribution, and establishment made in suitable localities. Except under conditions of a high water table, or of irrigation, there seems to be little or no future for the species below the latitude of Carnarvon.

FRUIT JUICES AND RELATED PRODUCTS.

By V. L. S. CHARLEY, and T. H. J. HARRISON.

(Technical Communication 11 of the Imperial Bureau of Horticulture and Plantation Crops, East Malling, Kent, England, 1939, pp. 104, figures 49, bibl. 118, 5s.)

Whether we have suddenly developed sense, or whether the old slogan "an apple a day keeps the doctor away" has at last struck home, is immaterial. The fact remains that we do eat more fruit and that more fruit is being produced. Market quality standards have become higher and growers are now faced with the problem of how to dispose satisfactorily of fruit which does not come up to the accepted standards of size or colour, though otherwise perfectly good. Among processes offering a solution, that of unfermented juice production has long commended itself to fruit producers in Europe and the U.S.A.

Hitherto, though short articles on different aspects of processing have been available since 1914 in the annual reports of the Long Ashton Research Station, lack of precise information on the exact technique employed has checked progress in England.

It has remained for Charley to give under one cover a complete detailed account of the manufacture of apple juice based on his knowledge of the latest foreign methods and on his own continued investigations at Long Ashton.

In the present bulletin he deals with the manufacturing process in detail starting with the selection of the fruit and taking us through every stage in turn up to the disposal of the final product in bottle, can or other type of dispenser. He does not confine his remarks to any one process but gives particulars of different methods found satisfactory and discusses their merits.

Further he deals more briefly with such other fruit products as grape, citrus and soft fruit juices, cider, fruit wines, etc., with the concentration of fruit juices by hot processing, by freezing and by spray drying, and with the disposal of pomace.

He describes methods of analysing juice for the determination of specific gravity, total acidity, tannin, alcohol and sulphur dioxide.

Finally he discusses the suitability of particular metals and alloys for the construction of the requisite apparatus, the clear illustrations of which add greatly to the usefulness of the publication.

But the problems of juice production do not, unfortunately, begin and end with its manufacture, and the economic and nutritional aspects are equally important. We are, therefore, grateful to Harrison for his concise and adequate treatment of them in the first twenty pages.

He shows that a permanent fruit juice industry on a large scale can only be developed where large supplies of raw material are available each year at a reasonable price. The cost of manufacture is not small, and if sales are to grow it is essential that retail prices should be reasonably low so as to compete with other drinks. This means that distribution costs must be low and that the industry must depend essentially on its home market. Here regulations are necessary to protect it from competition with synthetic products.

The nutritive and therapeutic qualities of fruit juices are discussed at sufficient length to show their great value, not only to children and invalids and for the treatment of gastric troubles, but also in the diet of the normal healthy adult.

A short glossary is included for the use of the less expert, and this together with the comprehensive index should make the information readily accessible to all.

"APPLE TREE PRUNING."

(WITH A MINIMUM OF INJURY TO THE TREE.)

Geo. W. Wickens, Superintendent of Horticulture.

I have chosen the above as a heading to this article because I wish at the commencement to stress the fact that neither in winter nor summer can apple trees be pruned as pruning is practised in Western Australia without injuring the trees to a greater or lesser extent, the amount of injury done being governed by the violence of the operation.

Fortunately, so far as summer pruning is concerned, there are not many growers who still adopt that method in endeavouring to induce or increase fruit-bearing habits, the intelligent use of lateral growths having superseded for this purpose the summer pruning which many years ago was quite common: and summer pruning in the great majority of orchards is now limited to removing sufficient young shoots on varieties such as "Yates" and "Dougherty" to allow the sun's rays to reach and colour the fruit. On strongly growing trees with heavy foliage this amount of summer pruning is necessary and cannot be avoided, but even here what I have said above about injuring the tree holds good, though the damage done is so slight as to be practically negligible.

It is in ordinary orthodox winter pruning, however, where hard cutting, particularly of young trees, is believed to give strength, that very real damage to the trees is being caused, and although I have not enough facts before me to state definitely that hard winter pruning is one of the main contributing causes to the condition in apple trees known as "die-back," I firmly believe such to be the case. For the past ten years I have been closely watching the growth of apple trees which have had winter pruning limited to removal of excess shoots before these have grown into limbs, and the usual ordinary treatment of fruit-bearing laterals; the extra vigour of trees so handled compared with those pruned in the ordinary manner is outstanding. I would like here to state, for the information of the many apple growers in Western Australia who have attended pruning demonstrations given by myself that during the many years I have been attached to the Department of Agriculture—starting with the first pruning demonstration at a small orchard in the Upper Blackwood in 1903—I have changed by degrees from a fairly hard pruner with a liking for fruit borne on short spurs, to one who would endeavour to train the tree from the time of planting in such a way that all hard cutting would be eliminated. Those who have followed my demonstrations will know that at first "Jonathan" was the only variety upon which I used laterals for carrying the fruit, all the rest I spur pruned, but eventually I reached the stage when all varieties were treated as lateral bearers, and I believe I was the first in Western Australia to give demonstrations showing that the best results could be obtained with "Yates" when these were made to produce their fruit on laterals instead of spurs, this latter variety having been looked upon as essentially "spur-bearing."

As stated above I have been closely watching trees very lightly pruned and judging results since 1929, and though I was convinced five years ago that our pruning system required changing I had not sufficient tangible results to put before growers as proof, until one of these trees—the only one I had handled from time of planting—had cropped for several years. Last year I considered the test sufficient, and I broadcast on 6th May, 1938, particulars of the new system, and advised growers to try it. I have been flattered by the number of growers who have followed that advice in the winter pruning seasons of 1938 and 1939, and whereas previously there were only a few trees from which to make comparisons,

now there are literally thousands, and while the system advocated can only attain its best when done from the time the tree is planted, it can be applied at any stage to a tree that is making vigorous growth.

What first caused me to think that pruning the leading shoots of an apple tree had an injurious effect on their growth was noting that stronger and better growths were made by any shoots that had been, either by accident or design, left unpruned.

The commonest occurrence, and one that all pruners must have noticed, is the effect of leaving unpruned the growth arising from the second bud from the top of the leader, and pruning the shoot arising from the top bud: in practically every instance the growth from the lower bud will far exceed that from the top bud, and, to quote a very common saying amongst pruners—"it has robbed the leader." Reverse the position by pruning the lower shoot allowing the top one to remain unpruned, and the top shoot will show the greater growth. Right through the tree this principle holds good; the unpruned shoot—other things being equal—exceeding the growth of the pruned shoot. I am giving the above as one instance that I had noted, but there were many, very many, others, and they occurred not only on apple trees, but on pear and stone fruit trees as well. To mention them would make this article unduly long, so I will only say to growers who are interested, and who want proof—"Go ye out into your orchards, seek, and ye shall find."

"The System."

Commence at the time the tree is planted, and if when it is received from the nursery it has three or four nicely spaced limbs of equal growth, allow these limbs to remain unpruned, but in early September put a shallow nick through the bark above one or two buds where limbs are required for leaders. Varieties like "Yates" and "Granny Smith" without nicking usually throw out a sufficient number to allow a choice of the best to be made, but varieties like "Cleopatra" and "Dunns" instead of making side shoots often turn to fruit buds, and to make certain of growths for leaders it is best to nick above the buds where the limbs are required. If the young trees, when received from the nursery, have three or four limbs which are not of equal growth, but have one strong and two or three weak, or two strong and one weak, or two strong and two weak, or any other combination, cut the strong ones back to a length of four to five buds from the base and let the weak ones remain unpruned. If the root system is evenly distributed around the base of the tree (not one-sided) it will be found in practically every instance that the growths made, from the unpruned weak limbs will be so much stronger than the growths made from the strong pruned limbs that the tops when the season's growth is finished will be nearly level, and not only that, but the previously weak limbs will be stronger than the previously strong ones.

Figure 1 illustrates a "Yates" apple tree: a weak tree (a whip) at time of planting in July, 1937. It was cut back and threw out one strong limb and three weak ones. The strong one was pruned to about four buds from the base—see white mark on limb near fork—and the other three were left unpruned. The figure shows that the growths from terminals (see narrow white mark) of the three weak limbs have not only equalled in length the growth from the strong limb, but are now stouter and stronger right down to the fork than the pruned limb. The orchard where this photograph was taken comprises nine acres of young trees, and in every instance where there were strong and weak limbs on any tree the strong were pruned and the weak left unpruned and in every case the result was similar to that described.

Fig. 2

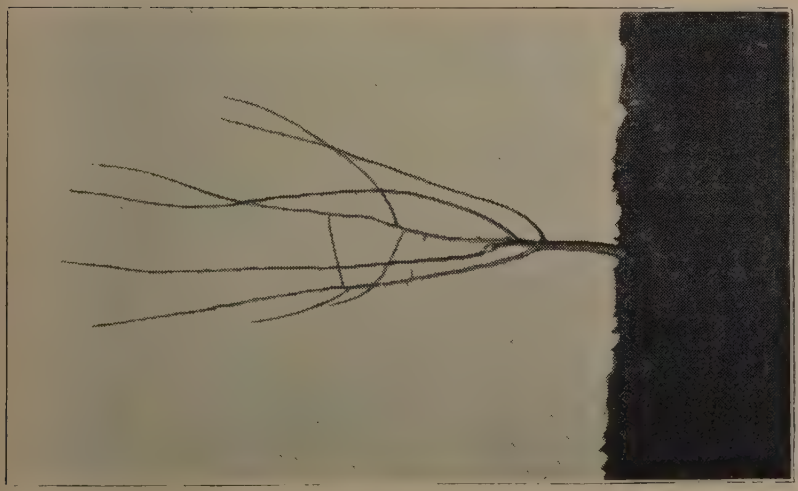


Fig. 1

Fig. 4

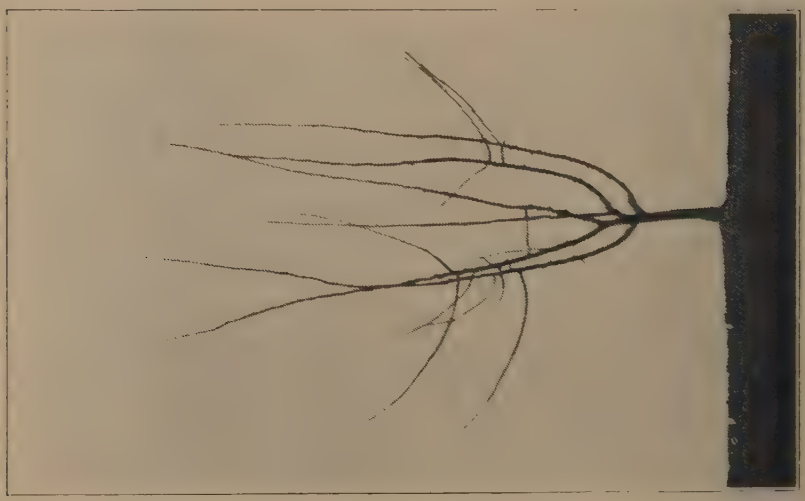


Fig. 3

Figure 2 illustrates a "Yates" apple tree, planted July, 1937, pruned at planting, and only one limb pruned in 1938.

Figure 3 is the same tree pruned this season in accordance with the new system. It will be noted that apart from removing the side shoots from the top of one leader on the left (an essential factor in the system), and one shoot at the bottom that was growing straight up through the tree, hardly any cutting has been done. The tree is so well shaped that very little propping out is required, one spreader between two limbs being all that is necessary.

I would like here to draw attention to the limbs growing out from the main limbs. These will not be pruned, and will be used as subsidiary leaders to assist in forming the main framework of the tree. Another fact worth mentioning is that limbs coming out at the angle shown, and not situated at nearly one level, like leaders arising from the end buds of a pruned shoot, are much the stronger and better placed.

Figure 4 is a photograph of a "Granny Smith" apple tree with two seasons' growth, planted in 1937, pruned at time of planting and unpruned in 1938.

Fig. 5

Figure 5 is the same tree as shown in No. 4 pruned in August this year—a well shaped tree, strong and vigorous, required very little pruning, excepting removal of side growths near tops of leaders.

Though I have only used "Yates" and "Granny Smith" as illustrations there are "Jonathans," "Cleopatras" and "Delicious" treated in the same way in the same orchard, all quite successfully. In connection with "Jonathans" I thought at first it was one variety to which the new system could not be applied on account of its weak and rather bushy habit of growth, and its propensity to crop on the previous year's growth, whether lateral or unpruned leader, but experience has shown the advantage in growth is such that the extra time entailed in stripping blossoms or young fruits from the terminals of the unpruned leaders is well repaid by the extra vigour imparted to the tree.

It must be remembered that during the first three years, no matter what variety of apple tree is under consideration, fruit must not be allowed to grow on or near the ends of the leaders, and to prevent this either the blossoms or young fruits must be removed. If allowed to remain the weight of fruit will bend the leaders out of shape.

When training young trees having an upright habit of growth, such as "Cleopatra" and "Granny Smith" it is essential that either by propping or using spreaders between limbs on opposite sides of the trees, the trees are opened sufficiently in the centre to allow light and air to circulate freely and room between the limbs for fruit bearing laterals. Care must be exercised when spreading the trees in this fashion to avoid placing any limb at such a wide angle that the inside buds will grow upwards to the detriment of growths from the terminals and from the buds on the outside of the leaders—these latter growths, as pointed out earlier in this article, form the sub-leaders. Trees treated in the manner advocated, if healthy, will commence bearing in their fourth year, and from then onwards pruning is simple, merely comprising the removal of side growths from the leading shoots, always keeping the topmost growths unpruned, the removal of excess growths before they obtain sufficient size to require being cut out as limbs later in the tree's life, and treatment of laterals as the main source of fruit production.

A bit of advice about laterals might be of service here and it is this—use every endeavour to provide laterals that as nearly as possible spring direct horizontally from the larger growths whether leaders or sub-leaders; a lateral that has been heavily pruned as a spur for several years before being allowed to remain with an unpruned terminal, is in the same injured condition from over-pruning as the annually pruned leader. When lateral growths have reached a length greater than they can support, or bring to size, the fruit borne on them, then shorten them back to a suitable length.

Figure 6 is a photograph, taken in August this year, of a "Granny Smith" apple tree in Mr. George Parke's orchard at Donnybrook, which in 1930 he very kindly handed over to me for the purpose of testing my theories about unpruned terminals. The tree is one of 400 whips planted in 1930, and it is mainly due to the knowledge I have gained with this tree during the last ten years that I now can confidently describe the system as a success. It will be noticed a prop was needed last year to help support the crop, and there are growers who state that any system of pruning which does not make the tree rigid enough to carry its crop without other support to the limbs, is not worth considering: but a tree that bears as this tree has borne is worth propping, and even in orchards trained in the orthodox manner it is rare to see one where supports are not needed in seasons of heavy crops. This tree was supported by a prop in the centre, maypole fashion, and the small black objects showing amongst the limbs are pieces of leather attached

to the wires which extended from the pole to the heavily laden limbs before the crop was gathered, the leather being used to prevent the wires from cutting into the limbs.

Fig. 6

The history of the tree's production is as follows:—

Planted 1930.

In 1934 produced 1 case.
In 1935 produced 4½ cases.
In 1936 produced 8 cases.
In 1937 produced 8 cases.
In 1938 produced 10 cases.
In 1939 produced 10 cases.

A fine record truly!

Figure 7 is a "Granny Smith" in an adjoining row, one of the 400 planted at the same time, and is a fair average specimen of the trees which have received exactly the same treatment in every respect—fertilising, cultivation, etc.—as the

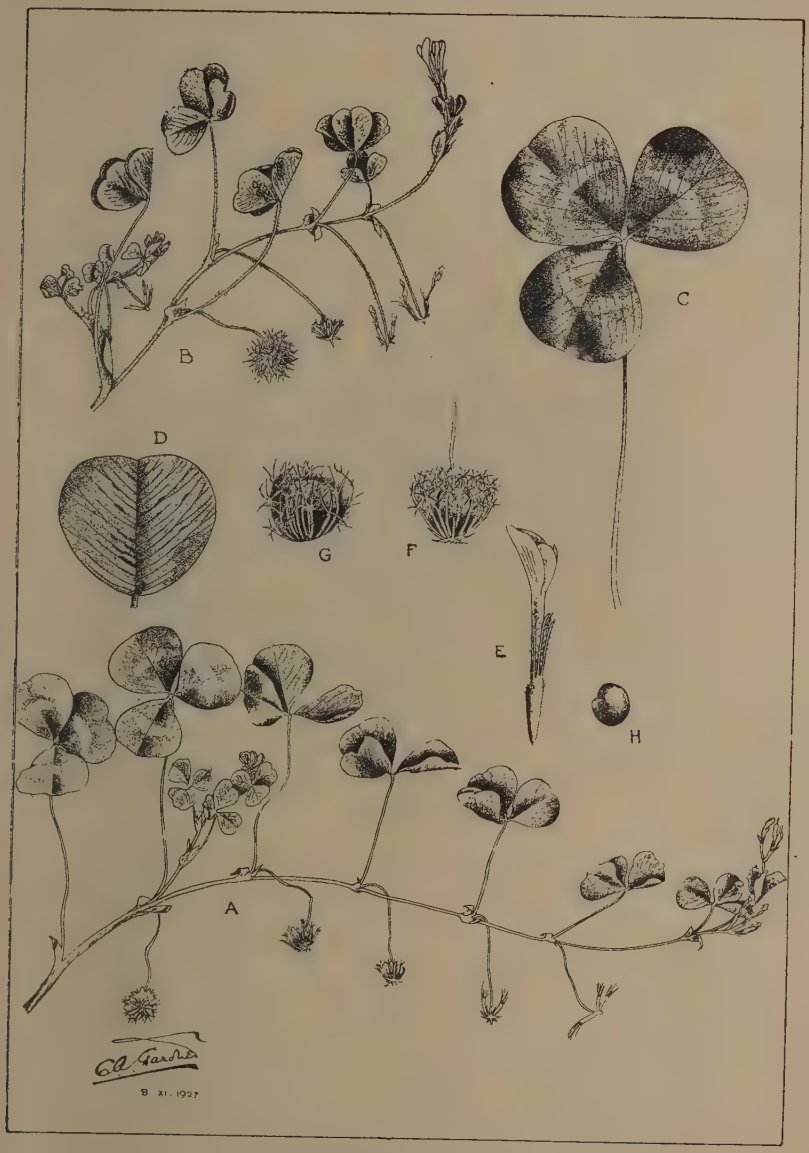
Fig. 7

experimental tree, the only difference being pruning. The experimental tree commenced bearing in earnest in 1935, the remainder waited until 1938, and then only produced an average of 1½ cases per tree.

SUBTERRANEAN CLOVER SEED.

G. R. W. MEADLY.

The production of subterranean clover seed is a comparatively recent development, for the first serious efforts to harvest the seed were made in South Australia in 1900. At first, the production rate did not increase very rapidly. Statistics show that in South Australia only five cwts. of seed were harvested from ten acres in 1916-17 with a marked advance in 1923-24, when 807 cwts. were secured from 405 acres. In the 1929-30 season, the output had reached 250 tons which probably represents the present annual average production, although this naturally depends on seasonal conditions and also, to an appreciable extent, on the demand for seed.



SUBTERRANEAN CLOVER.

(*Trifolium subterraneum, L.*)

A. and B.—Portion of plant showing habit and development.
C.—Leaf showing whitish crescent-shaped markings.
D.—Leaflet with brown flecking (on veins near midrib).
E.—Flower.
F.—Maturing seed head.
G.—Ripe burr with three pods.
H.—Seed.

About the same time that seed production commenced in South Australia, the first sowings of subterranean clover were being made in this State. A number of years passed before the real value of this clover was realised, but with the increasing use of superphosphates its importance was accentuated and growers became interested in the production of seed locally.

At first the methods used were crude, the burr being raked into heaps and sold without any further treatment. The more progressive farmers soon realised, however, that this method was not satisfactory, as it provided an excellent means of spreading both serious weed and insect pests. The actual crop likely to be secured from the burr was also difficult to assess. The early producers overcame many difficulties by ingenious inventions and at the present time Western Australia, besides providing its own seed requirements, supplies large quantities to the Eastern States and New Zealand markets.

STRAINS.

With a crop which is grown so extensively and under various conditions, differences in the nature of individual plants must be expected and many different strains have been noted. Some of these have been little, if at all superior, in any quality to the strain in general use, while others have been found to possess distinct advantages. The most important variant commercialised in this State is the early (Dwalganup) strain. Plants of this strain will flower considerably earlier than those of the mid-season (Mt. Barker) type and consequently seed formation commences earlier in the season.

In Western Australia one of our main difficulties is to grow a suitable leguminous crop in areas where the rainfall is not only low, but falls during a comparatively short period during the winter months. To be effective a crop must seed itself down each year, that is, not require re-sowing each season. This necessitates growing a plant which matures its seed while sufficient moisture remains in the soil. The early strain, depending on locality and season, commences flowering about the second week in August, while the mid-season strain commences about mid-September in the earlier districts and mid to late October in the later southern areas.

Bearing in mind this difference between the normal flowering periods, it is not difficult to realise the fact that the early strain is grown successfully in areas having a rainfall of 16 inches, or sometimes even less, while, to secure the best results, the mid-season strain requires at least 25 inches per annum. The advantages are not entirely with the early strain, however, for during the first season in particular it produces less leafage, and is not as suitable as the mid-season strain for the better rainfall areas. The two strains, therefore, are not at variance but supplementary to one another and one sown where the other should be grown will mean decreased returns, or possibly complete failure of the crop after the first year. Much mid-season seed has been wasted in the drier districts in the past and these early efforts have done much to discourage the growing of subterranean clover in those parts, although the early strain may be well suited to the conditions.

STRAIN CERTIFICATION.

The knowledge concerning the correct strain does not overcome the difficulty entirely, however, as the seeds of the two strains under discussion are so much alike that they cannot be definitely separated by examination. This difficulty has been eliminated by a seed certification scheme instigated by the Department of Agriculture in 1934. The essential features of this scheme are—firstly, the inspection of pastures during the growing period in order to ascertain whether the stand is sufficiently pure to warrant registering for the production of certified seed. At

this stage, the strains can be detected and the suitable areas are mapped. The next provision is the appointment of an Inspector to the producer's property for the entire period during which gathering, cleaning and grading are carried out. The duties of the Inspector are to check the areas from which the burr is secured, test the actual pure seeds content of the final seed, provide the necessary slips and tags, seal the bags and forward a representative sample from each bag to this office for checking purposes and testing for germination. Two grades are recognised, viz., not less than 98 per cent. and not less than 96 per cent. pure seeds. Each bears a distinctive tag and a slip is placed inside the bag. Information concerning the germination may be secured by referring the certificate number recorded on the tag and slip to the Department of Agriculture, Perth.

Certification tag for the early strain.

DEPARTMENT OF AGRICULTURE,
Western Australia.

CERTIFIED EARLY STRAIN (DWALGANUP) SUBTERRANEAN CLOVER SEED.

Grown on Registered Area No. .....

The Germination Certificate concerning this seed is numbered. .....

Date..... *This sack was sealed by*.....

[See over.] ***Inspector.***

(*Front*)

This Certification gives warranty as to Strain and Purity. Details as to Germination are obtainable from the Dept. of Agriculture, Perth, on quoting the Certificate number.

The purity is not less than 98 per cent.

(*Back*)

Facilities are available for the certification of both the mid-season and early strains, thus providing a guarantee concerning strain and pure seeds content, and also a reference by which the germination of the line may be secured.

The scheme protects the purchasing farmer, at the same time assisting the grower and seed merchant. The term "certification" is immediately associated with quality, and this serves to advertise as well as standardise the commodity.

Seed certification is by no means a local innovation but is closely associated with the industry in all parts of the world. The extra cost of sowing certified subterranean clover seed is less than one shilling per acre, a very small amount when compared with the difference which may result in the crop due to securing a wrongly named strain or a mixture of which only a small proportion is satisfactory.

Farmers are strongly urged to be "strain minded" and insist on certified seed bearing the Government seal and tag. The slight extra cost may well be regarded as cheap insurance against inferior lines.

PURE SEEDS CONTENT.

The Department has also provided facilities for the testing and sealing of subterranean clover seed on a purity basis, irrespective of strain. If the seed is found to consist of at least 98 per cent. pure seeds, a slip and tag showing this information are provided and the bag is sealed. During the past season, 290 tons were tested on a purity basis.

Despite the fact that the Agricultural Seeds Act includes a standard of at least 96 per cent. pure seeds for subterranean clover, some farmers still seek seed of low quality at a so-called cheap price and imagine they are securing bargains. The best way to refute this assumption is to quote an actual case which came before our notice recently. A sample submitted by a farmer after purchasing the seed was tested and gave the following results:—

Pure seeds	78.7%	Germination	34%
Weed seeds	.7%	Hard seeds	65%
Inert matter	20.6%	Dead seeds	1%

The inert matter consisted of stick fragments, pebbles and soil particles and the line contained an estimated number of 90 Guildford grass (*Romulea rosea*) seeds and 45 Cape tulip (*Homeria sp.*) bulbils per pound. The actual value, that is, the percentage of pure germinable seeds (including one-third of the hard seeds) is 44 per cent., while that of a good line is in excess of 80 per cent. As, at the time, first grade seed was quoted at 1s. per pound, the sample under consideration had an approximate value of 6½d. per pound. It was purchased for 8d. per pound.

DISSEMINATION OF PESTS.

Further, it contained bulbils of Cape tulip, a very serious weed poisonous to stock, besides sufficient Guildford grass seeds to provide a heavy infestation within a few years. To paint a really black picture, any losses of stock due to Cape tulip poisoning could be debited rationally to the original cost of the seed which was already on the wrong side of the ledger compared with a line of good quality.

To go still further the soil particles present would provide an excellent means of spreading the eggs of such troublesome pests as the red-legged earth mite and clover springtail (lucerne flea). The loss due to their introduction is difficult to assess. This was obviously a flagrant case of false economy.

The cost of seed represents only a fraction of the total cost of establishing a pasture, but unless that seed is capable of producing a satisfactory proportion of vigorous plants without introducing pests—insect pests, disease or weeds—the other operations are nullified to a greater or lesser extent. When buying the super for the same pasture the soluble phosphate content is known and it is equally important to know the purity and germination figures of the seed itself. No amount of cultivation and super application will produce a satisfactory pasture from low grade seed.

Some farmers actually ask for seed containing grit and soil particles, claiming that the bacteria so necessary for the prolific growth of clovers is carried on these impurities. This is frequently quite true but, at the same time, these same particles may be transporting thousands of eggs of the red mite and lucerne flea When we realise that the necessary bacteria can be introduced by means of cultures obtainable at a small charge from this Department without the risk of introducing insect pests the claims for this type of seed become groundless.

"COATY SEEDS" AND "HARD SEEDS."

You may have heard the expression "coaty seeds." These are seeds from which the pod or covering has not been removed during the cleaning operations. Again the claim is made that these coats act as a transporting medium for the bacteria, but again the advantage is not without its usually more than counterbalancing disadvantages. Coaty seeds of this nature cannot be graded and cleaned to the extent of completely hulled seed and consequently there is a greater risk of harmful impurities.

The germination aspect is also affected. Seeds which still remain in their pods have undergone little or no abrasion during the machining operations and contain a high percentage of so-called hard seeds. These do not absorb moisture readily and may remain in the soil in a dormant condition for a period of years. They represent a factor in maintaining subterranean clover pastures, but their main value becomes evident in the years following the initial sowing. Seed resulting from the previous season's crop lies on or just under the soil surface and germination of a considerable percentage may be induced by early rains, only for the seedlings to be killed by a lengthy period of dry weather. When the regular winter rains commence some of the seeds with a degree of hardness which did not respond to the unseasonal rains will produce plants. Others with a greater degree of hardness will remain in the soil in a viable condition for still longer periods. The 1939 season in Western Australia supplied an example of this natural provision. In many districts paddocks green with subterranean clover seedlings resulted from the heavy rains experienced in February. On many areas a large percentage of these seedlings died owing to lack of moisture, but the reserve supply of seed remaining in the soil was sufficient to originate a satisfactory pasture with the regular April-May rains.

When the farmer himself is able to regulate the time of sowing, however, a high hard seed content loses much of its useful properties; in fact, in the main must be regarded as a disadvantage as the usual requirement is a quickly formed pasture with as low seeding rate as possible. Naturally this will not be secured if a high percentage of the seed sown remains dormant for an appreciable period.

Seed purchases are frequently made in a most haphazard manner without giving any consideration to strain, purity and germination. The importance of these three aspects cannot be overstressed. By purchasing certified seed farmers are assured of the correct strain and a satisfactory pure seeds content. Information concerning germination may be secured by submitting a sample or referring the certificate number on the bag to the Department of Agriculture.

TOBACCO GROWING IN WESTERN AUSTRALIA.

(Continued.)

A. Sharp, Tobacco Adviser.

Fertiliser.

The fertiliser in general use in this State is a "complete" one having an analysis of 3.3 per cent. nitrogen, part of which is supplied in the form of ammonia, 15.5 per cent. phosphoric acid and 5.7 per cent. potash. This fertiliser is obtainable mixed ready for use, or it can be made up according to the following formula:—

100 lbs. sulphate of ammonia.
50 lbs. nitrate of soda.
600 lbs. 22 per cent. superphosphate.
100 lbs. sulphate of potash.

The usual rate of application is from 10 to 12 cwt. per acre. Heavier dressings than this are sometimes given but are not recommended owing to the tendency to produce a thick, coarse leaf, particularly on the more fertile types of soil.

It is recognised in most tobacco growing countries that the finest quality leaf is obtained when part of the nitrogenous portion of the fertiliser is derived from organic sources such as dried blood, fish manure, cottonseed meal and so on. Experiments carried out at Manjimup by the Department over a period of five years, however, have shown that replacing the sulphate of ammonia by equivalent amounts of dried blood, fish manure or stable manure has given little or no improvement either in quantity or quality of leaf.

Preparation of Land for Planting.

When the soil has been worked to a fine tilth the rows are struck out at intervals of 3 feet to 3 feet 6 inches. The furrows should be about 4 to 6 inches deep and should preferably have a broad, flat bottom. A double-board drill plough or heavy scuffler fitted with hilling attachment are suitable implements for this operation. If neither of these is available an ordinary mouldboard or disc plough may be used. The fertiliser is applied in the furrow thus made, care being taken to spread it in as broad a band as possible. The furrow is then filled in, preferably with a scuffler with the hilling attachments reversed. This will thoroughly incorporate the fertiliser with the soil as well as fill in the furrow. The plants are set out directly above the band of fertiliser, and in order to obviate possible injury to the roots it is advisable not to plant out until a week or ten days after the fertiliser has been applied.

The method in vogue in most tobacco growing countries of setting out the plants on ridges is not practised in Western Australia owing to the danger of the ridges drying out. Under the climatic conditions obtaining here every effort must be made to conserve soil moisture as much as possible, and it is quite a common practice to only partly fill in the furrow and set the plants out in a slight hollow rather than on a ridge, the hollow being filled in by subsequent cultivation. On thoroughly well drained land or for late planting this method can be recommended.

Spacing of Plants.

The plants are usually set out from 2 feet to 3 feet apart in the rows. Generally speaking, varieties which may tend to produce a rather heavy leaf, such as Hickory Pryor, are best planted fairly closely, particularly on the more fertile

types of soil, while lighter varieties are frequently planted a full 3 feet apart and "on the square" so as to allow of horse cultivation in two directions during the early stages of growth, thus minimising hand labour.

The number of plants required will vary from about 5,000 to 7,000 per acre according to spacing.

Transplanting.

Practically all transplanting in this State is done by hand. The presence of large numbers of dead trees and stumps, which are extremely expensive to remove, on most of our tobacco plantations, together with the comparatively small scale on which most of our growers operate, militate against the use of the mechanical planter.

Planting out may be done from the middle of September until well into November, but it is considered that early October in the best time. As a rule, the weather experienced at Manjimup then is ideal for the purpose, being dull and cool with frequent showers.

If possible, the plants should be set out in the field within a few hours of being lifted from the seed-bed. In this respect the man who grows his seedlings on his own farm is in a much better position than the one who has to obtain his plants from a distance. The plants are dibbled in with the aid of a short dibbling stick, and the most satisfactory way of working is to have one person dropping the plants at the proper intervals along two rows with two others following immediately after to plant them. The plants should be set well down and the soil pressed firmly around the roots. It is very seldom that artificial watering is necessary at Manjimup unless planting has been delayed until well into November.

As the soils in the Manjimup district are heavily infested with subterranean clover weevil and, to a less extent, with cutworms and slugs, all of which are extremely partial to young tobacco, it is absolutely necessary to spread poison bait round the seedlings immediately after transplanting. A suitable bait is made by mixing 1 lb. of Paris Green in 40 lbs. of bran and moistening the mixture with about 3 lbs. of molasses dissolved in sufficient water to make a crumbling mash. This bait should not be allowed to touch the plants as the Paris Green may injure them. It should be laid late in the afternoon so that it is fresh and tempting when the insects come out at night to feed.

Where thoroughly healthy, well grown seedlings have been used and transplanting done carefully, very little replanting should be necessary. It is advisable, however, to go over the ground about four to six days after planting out and replace any seedling which appears to be failing.

Cultivation.

In about ten days after transplanting the seedlings will have become well established and cultivation may then be commenced. The ground between the rows may be stirred with the horse hoe, and the soil immediately surrounding each plant should have the crust broken to a depth of an inch or so with a hand hoe or rake. Great care should be taken not to cultivate too deeply close to the plants as this would disturb the roots and check growth.

From this time onwards the crop should receive frequent cultivations with both horse and hand hoe in order to keep down weed growth, aerate the soil and conserve moisture. The importance of this procedure cannot be emphasised too strongly. Probably no crop responds more to frequent and thorough cultivation during its growth than does tobacco. The object of the grower should be to keep

the plants growing steadily without a check of any kind, as it is only by so doing that first class leaf will be obtained. The advent of hot, dry weather conditions, which usually takes place during December, is likely to give a rather severe check to any crop which has to compete with weeds for the available soil moisture. Cultivation should be continued until the plants have reached such a size that further passage of the scuffler is likely to cause injury to the leaves.

Priming.

When the plants have reached a height of about 9 inches two or three of the bottom leaves should be removed, this operation being known as priming. These bottom leaves are small and of poor quality, and are usually more or less damaged by the lesions of downy mildew (blue mould), and the nourishment required by them is better diverted to the better quality leaf higher up the plant. The lowest leaf left on the plant should be well clear of the ground.

Insect Control.

Young tobacco is particularly susceptible to serious injury by insect pests. The most important of these in Western Australia are leaf-eating caterpillars, budworm and leaf miner. The plants must be kept well protected from attack by these pests by regular spraying or dusting with insecticide. Spraying with liquid insecticides is probably the more effective method, but involves rather more trouble than the use of poison dusts, consequently the latter method is the one in general use. An excellent poison dust is made by mixing 1 lb. of powdered lead arsenate in 20 lbs. of pollard. This can be applied to the plants by placing it in a small bag made of muslin or some other porous material. The bag is given a shake over each plant, thus distributing a small amount of poison over the leaves and growing tip. Dusting should be begun within a fortnight of planting out and should be continued at intervals of about 12 days until the plants are almost ready for topping.

Topping and Suckering.

The natural objective of any plant is the production of seed, and to enable it to do so large quantities of food materials are elaborated in the leaves. The tobacco plant is grown commercially for the sake of its leaf only, however, and in order to force the plant to confine its energy to the production of the maximum amount of leaf and to conserve the substances elaborated therein, the flower head is broken off, the operation being known as "topping." It will usually be found that the flower heads of some plants emerge earlier than others, and it is considered the best practice to wait until the more backward plants are ready before commencing to top, even if the more forward ones are showing a few open flowers. The simultaneous topping of all plants tends to bring them to maturity together.

The height at which the plants should be topped depends on their vigour and on weather and soil conditions, and a certain amount of experience is necessary to determine just how many leaves the plant is likely to be able to mature. If the plant is topped too low the leaves will be coarse and heavy, will mature very slowly and be very difficult to cure. On the other hand, too high topping increases the proportion of small narrow top leaves and reduces the body of the others. Generally speaking, a medium crop can be topped to about 14 leaves while a very vigorous one growing on land with an ample reserve of moisture can frequently mature up to twenty or even more leaves per plant. On the whole it is safer to top a little too high than too low.

After topping, the plant continues to endeavour to produce seed by sending out suckers from the axils of the leaves. These suckers must be removed when about 3 or 4 inches long otherwise they will rob the leaves of nutriment, with consequent reduction of size and quality. The process of suckering is a somewhat tedious one and, as the plants continue to send out fresh suckers to replace those removed, it has to be carried out several times. Many growers cease suckering after harvesting of the bottom leaf has commenced. They maintain that the presence of suckers helps to prevent the top leaf from going thick. It is very doubtful if this argument is soundly based. Experimental work in America has shown that the plant should be kept free of suckers if leaf of high quality is to be obtained. It is probable that higher topping together with rigid suppression of suckers until harvesting is finished will give the best results.

MORE SHEEP IN THE EASTERN WHEAT BELT.

W. M. Nunn, Agricultural Adviser.

With a poor outlook for wheat prices for some time to come, following as it does, so far as growers in the north-eastern wheat areas are concerned upon a succession of years of unfavourable growing seasons and low yields, many farmers are turning from wheat to study other avenues of production. While some feel confident that legislation will yet be passed to assure them a stabilised payable price for wheat, and others are turning to pigs, the majority are considering that sheep will become the more important source of income.

The usual farm in these areas is 1,000 acres and has grown about 300 acres of wheat per year on a three-year rotation of fallow, wheat, pasture. The term "pasture" is, of course, a misnomer, as only a poor stand of barley grass is obtained in the year following the crop and its carrying capacity is very low.

The problem confronting the farmer who desires to limit his wheatgrowing and to increase his returns from sheep is how to improve his carrying capacity—i.e., how to carry more sheep than he is carrying under his present system.

For several years repeated attempts have been made, both by the Department of Agriculture and by private farmers, to introduce pastures to the lower rainfall areas of the wheat belt. Though some species have given promise enough to convince us that they would grow successfully in satisfactory seasons, they have failed in recent years on account of dry conditions and the depredations of grasshoppers. Though seasons may improve and pastures may be established, it is not to be expected that they will have the carrying capacity or permanency of pastures in the more favoured districts, and when dry seasons return—as those in the north-eastern districts must surely expect after the evidence of the last five years—pastures will again fail.

It is essential, therefore, that those who are setting out to increase their flocks should thoroughly investigate the possibilities of increasing their carrying capacity by judicious hand-feeding, even while persisting with their endeavours to improve the feeding value of their pastures.

In the September, 1937, issue of this Journal is published an article on the conservation of fodder in the wheat belt. In this article the author (Mr. F. L. Shier) draws attention to the fact that the wheat belt areas experience two main seasons annually, the wet portion—during which the growth of crop and pasture

takes place—and the dry period when there is no growth at all. He points out that the dry period, frequently and aptly referred to as the annual drought, lasts up to six or seven months and suggests that the obvious method of carrying stock economically through the year is to conserve fodders which have been grown during the winter and spring for feeding during the late summer and autumn.

Adopting the basis for arranging reserves of fodder arrived at and explained in this article, provision should be made every season for—

1. Sufficient hay to supply all the sheep at the rate of 1 lb. per head per day for a period of four months.
2. Sufficient grain, oats or wheat, to supply weaners and mated ewes with ½ lb. per head per day for three months.
3. Where early lambs are being produced and no green feed is expected, silage should be conserved to supply the ewes with 2 lbs. per head for three months.

These figures represent a sufficient supplementary ration when the natural grazing becomes poor and the best of the stubble has been eaten out. One pound per head of good hay meets the requirements of all dry sheep and the half pound of grain supplies the extra growth and production requirements of the weaners and mated ewes, while the 2 lbs. of silage supplies the succulent laxative feed which is so essential for milk production.

Now, take the case of the farmer with 1,000 acres of cleared cultivable land, who has been harvesting 300 acres of wheat yearly and who now wishes to increase his flock of sheep from its present figure of 200-300 head. Let us see what conservation would be necessary to carry, say, 500 sheep through the summer and autumn months working from the basis suggested above, and then consider whether or not it would be possible to grow this fodder during the winter and spring without undue increase in cropping, and still carry the sheep through these months—and also whether or not it would be economical to do so.

Three different policies are open to such a sheep owner. He may use merino rams and rear his own ewe weaners to replace culled ewes; he may use Dorset Horn rams and sell the lambs as suckers for local consumption or for export should they reach export standard; or he may use one of the long wool British breeds.

It is not intended to discuss these policies except to say that the latter is the one recommended. In this case not only has the farmer the opportunity of selling his lambs either to the exporter or for local consumption, but if the season is poor and he is forced to carry over a large percentage, he will have a further avenue of disposal. The ewe progeny from the long wool cross will find a ready sale amongst the export lamb breeders in the more favoured districts.

If more farmers in the wheat belt can be persuaded to breed the long wool cross-bred mother of the export lamb, it should greatly assist the endeavours which are being put forward to improve the State's lamb export trade. Furthermore, it is earnestly believed that the demand for such cross-bred ewes will enormously increase and that high prices will be offered—certainly for the grown ewe and probably for the ewe as a lamb. The use of one of the long wool breeds is a type of cross-breeding which can undoubtedly be profitably undertaken in the Eastern wheat belt.

For the purposes of this article and the calculation we are about to make, it need make no difference which policy is being considered. In one case weaners have to be reared, while in another all progeny are sold as suckers. However, if weaners are reared an equal number of ewes must be culled and in our adopted

basis the feed requirement is the same for a weaner as for a mated ewe, so that in each case we have 500 sheep to be fed one pound of hay per day for four months and half a pound of grain per day for three months.

The quantities required to provide for such feeding are shown below:—

Number of Sheep.	Ration.	Period.	Amount to Conserve.	Area Required.
500	1 lb. Hay	4 months	27 tons	30 acres
500	½ lb. Oat Grain	3 months	250 bags	50 acres

The areas required for the production of these fodders will, of course, vary considerably with the district, the soil and the season, but the assumed figures above are surely within reach of all in average seasons.

Thus about 80 acres of cropping would supply the conservation requirements for the period of total hand-feeding as set out in the article mentioned previously, but the usual cropping programme is in the vicinity of 300 acres.

It is not intended to state what number of sheep could be safely grazed throughout winter and spring by the farmer who is able to stock up knowing that conserved fodder is assured to see him through the summer and autumn, because conditions will vary so greatly in different districts and different seasons. It is suggested, however, that with the assistance of some cheaply scratched-in cereal for grazing purposes and some further conservation in addition to above basic requirements, considerably more sheep could be carried than at present. Surely with wheat at its present price it will pay to conserve large reserves of fodder and to obtain a price for it through the wool and lamb returns rather than to market the lot as wheat grain.

Silage has been left out of the estimated conservation requirements so far because it is not in all cases warranted, and we have been adhering to the minimum requirements for satisfactory feeding. Where lambs are dropped before green feed is available, silage should certainly be provided for the milking ewe. Silage is very simply made in trenches anywhere in the wheat belt and is of inestimable value as a substitute for green feed. It lasts indefinitely as a reserve of fodder and every farmer who has stock to provide for in uncertain districts should take the opportunity this season of ensiling reserves against the probability of feed shortages in later years.

The above estimated yields, areas and suggested requirements for a flock of 500 sheep should serve as a guide to the farmer who has difficulty in deciding how much of his crop he should cut for hay or for silage. Even for a much larger flock of sheep the suggested programme is not an alarming one and this season farmers in most districts should take the opportunity after the lessons of recent drought years, of conserving both hay and silage as fodder reserves against future bad seasons in addition to the ordinary yearly requirements.

Ample provision should, of course, be made for all other farm stock, including horses, cattle, pigs and poultry.

Should a farmer intend devoting portion of his present wheat production to the feeding of a greater number of sheep, there are many points not touched on here for him to consider. He should make every endeavour to increase the carrying capacity of his pasture and with this end in view, it would probably be advisable to make some alteration in his system of rotation. An article by Dunne and Shier in the June, 1934, issue of this Journal gives interesting and useful suggestions on this matter.

In conclusion, the main points are repeated for emphasis. Present indications are not promising for wheat prices, these may be so low that, in many cases, there may be little or no profit to the grower. The North-Eastern wheat belt is experiencing its first favourable season since 1934 and excellent hay crops are to be seen everywhere. Farmers are urged to remember how short of feed they were in recent years and to take this opportunity of conserving large reserves. Hay cutting time does not last long and this article is intended not only as a guide to those who would carry more sheep, but as a suggestion to all farmers while there is still time—while the crops are yet in the hay-cutting stage—that value can be obtained from them despite the low price of wheat.

THE OFFICIAL PURE BRED DAIRY CATTLE PRODUCTION RECORDING SCHEME 1938-39.

Conducted by Officers of the Dairy Branch, Department of Agriculture.

It is pleasing to note in the results shown below that the standard of butter-fat production in pure-bred herds during the past year has been maintained, this mainly being due to supplementary feeding of conserved fodder during the dry months.

Of the 421 sets of results, 46 cows were either sold or withdrawn owing to sickness after having been tested less than 150 days, and in consequence their productions do not figure in any of the averages.

The remaining 375 cows averaged 6,433 lbs. milk, 4.55 per cent. test and 292.40 lbs. of butter-fat, without allowances, and although this butter-fat figure is nearly six pounds lower than last year, the percentage of cows passing the standard is considerably higher, particularly in the Jersey breed, which showed only 35.6 per cent. of passes last year, the lowest percentage for many years.

Table I. below sets out the position according to breeds and age classes.

TABLE I.

Age Class.	A.I.S.		Guernsey.		Jersey.		All Breeds.	
	No. Cows Tested.	No. Passing Standard.	No. Cows Tested.	No. Passing Standard.	No. Cows Tested.	No. Passing Standard.	No. Cows Tested.	No. Passing Standard.
Mature	43	17	27	14	34	11	104	42
Senior (4 years)	15	5	4	3	7	2	26	10
Junior (4 years)	20	10	2	2	4	1	26	13
Senior (3 years)	10	3	6	5	12	7	28	15
Junior (3 years)	33	27	12	10	12	10	57	47
Senior (2 years)	25	12	5	4	19	14	49	30
Junior (2 years)	36	24	21	17	28	19	85	60
Totals ...	182	98	77	55	116	64	375	217
Per cent. Passing Standard ...	53·8		71·4		55·2		57·9	

There is every reason to believe that the percentages above will improve during the next few years as it will be seen that the number of passes amongst the young cows is much higher than in the senior 4-year-old and mature classes.

The present good price for butter-fat and the keen demand for bulls ex high producing dams should be an incentive to breeders to cull out low producers, and by judicious feeding, which includes up-to-date methods of pasture management, build up a herd of high producing cattle which would remain profitable in the event of a drop in the price of butter-fat.

Table II.

AVERAGE BUTTER-FAT PRODUCTION IN EACH CLASS.

Age Class.	A.I.S.		Guernsey.		Jersey.		All Breeds.	
	No. Cows.	Average Butter-fat.	No. Cows.	Average Butter-fat.	No. Cows.	Average Butter-fat.	No. Cows.	Average Butter-fat.
Mature	43	331·62	27	349·73	34	310·97	104	329·57
Senior (4 years)	15	319·09	4	372·80	7	326·50	26	329·35
Junior (4 years)	20	309·82	2	403·65	4	307·38	26	316·66
Senior (3 years)	10	251·87	6	322·45	12	269·97	28	274·76
Junior (3 years)	33	302·49	12	315·95	12	311·48	57	307·24
Senior (2 years)	25	243·95	5	308·31	19	262·04	49	257·51
Junior (2 years)	36	240·60	21	256·62	28	239·39	85	244·16

In the above table the average butter-fat productions, according to age-class and breed, are shown and it will be seen that the senior 3-year-old and mature classes are responsible for the lowering of the general average, the A.I.S. breed being particularly low in the former class and Jerseys in the latter.

Although a general improvement throughout the scheme should be evident from year to year, it must be borne in mind that results are affected materially by changes in the personnel of the owners of herds under test. Thus, several familiar names are missing from Table III. and fresh names appear, such as that of Mr. W. Darnell of Rosa Brook, who is to be congratulated on his results after only one year of testing.

With the exception of last year, the A.I.S. breed has provided the Champion Herd Sire for many years, and the success this year of the Queensland bred "Blacklands Monarch's Commander" (1877) owned by Mr. W. G. Burges, has added to the list drawn from this popular breed. His six leading daughters, comprising two junior 2-year-olds, one senior 2, two junior 3-year-olds and one junior 4, averaged 379.83 lbs. of butter-fat, or with age allowances, 459.70 lbs. of butter-fat.

A trophy presented by the Jersey Herd Society to the owner of the six leading Jersey cows, with age allowances, was won by Mr. A. J. B. Strempel with an adjusted average of 461.51 lbs. These six cows however, were not all by the same sire.

Detailed results of all tests completed during the year are shown in Table III.

TABLE 3.

Cows which completed Test during 12 months ended 30th June, 1939.

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Calving.	No. of Days in Test.	Weight of Milk Last day of Test.	Weight of Milk for period.	Average Test.	Weight of Butter-Fat for period.	Owner.	Sire.
COWS UNDER 2½ YEARS—STANDARD 230 LBS. BUTTER-FAT.						lb.	lb.	%	lb.		
Greenmount Marinora's Model	Jersey	..	3-4 36	27 5-38	273	14	7,040	5·42	381·72	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Wooroloo Flash III.	A.I.S.	23243	1-6-36	1-10 38	273	32	8,436	4·42	372·98	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Tipperary Fairy III.	do.	22905	1-9-36	29 9-38	273	33	8,664	4·28	370·56	W. G. Burges ..	Blacklands Monarch's Commander (1877)
Greenmount Golden Lass	Jersey	....	30-9-36	16 9 38	273	16·5	6,350	5·80	368·29	A. J. B. Strempel ..	Bellefaire Bonaparte's Bonetienne (9224)
Travalgan Starbright III.	do.	59778	1-5 36	31 5 38	273	18	6,752	5·25	354·72	Robinson Bros.	Travalgan Northern Noble (10124)
Tipperary Dove V.	A.I.S.	22902	20-8-36	29 7 38	273	22	7,971	4·14	330·35	W. G. Burges ..	Blacklands Monarch's Commander (1877)
Grass Vale Buttercup IV.	Jersey	..	11-9 36	6 8-38	273	14	5,652	5·53	312·73	R. H. Rose ..	Selsey Gay Boy (15134)
Glanavon Buttercup	A.I.S.	..	4-5-36	17-9 38	273	22	6,216	5·01	311·42	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Denmark Rosemary	Guernsey	5451	7-6-36	7 7-38	273	13	5,649	5·50	310·80	Denmark Research Station	Koojan Golden Prosper (2283)
Wooroloo Jeanette II.	A.I.S.	23250	1-8-36	21-8-38	273	21	7,533	4·07	306·58	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Glanavon Venus II.	do.	20214	4-11 35	3-4-38	273	22	7,431	3·98	295·37	Wooroloo Sanatorium Farm	Villiers of Darbalara (2386)
Koojan Ace's Jean	Guernsey	5660	10-3-36	11 10 37	273	17	5,451	5·39	293·95	A. W. Padbury ..	Homestead Ace (imp. U.S.A.) (1631)
Koojan Ace's Wavelet	do.	5662	21-11 35	31-3-38	273	16·5	5,690	5·14	292·42	J. R. Giles ..	Homestead Ace (imp. U.S.A.) (1631)
Brookfields Golden Queen III.	do.	5324	16-3-36	22-3-38	273	17	5,601	5·21	291·71	P. G. Hampshire ..	Koojan Ace's Majestic (2735)
Tipperary Beauty IV.	A.I.S.	22897	20-6 36	27 7 38	273	18	6,879	4·21	289·39	W. G. Burges ..	Blacklands Monarch's Commander (1877)
Wooroloo Empress	do.	23241	1-11-35	6-4-38	273	15	6,975	4·12	288·21	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Yanget Duchess III.	do.	23297	12-7 36	9 9-38	273	19	6,747	4·25	287·00	A. E. Grant ..	Blacklands Lancer (1874)
Denmark Wild Rose	Guernsey	6974	1-7-36	22-8-38	273	15	5,595	5·10	285·51	Denmark Research Station	Koojan Golden Prosper (2283)
Muresk Mabel	do.	7644	24-6 36	20 8-38	273	16	5,831	4·86	283·50	Muresk Agricultural College	Minnamurra Plaintiff (1318)
Tipperary Dove 8th ..	A.I.S.	22904	6-10-36	10 9-38	273	25	6,465	4·32	279·12	W. G. Burges	Blacklands Monarch's Commander (1877)
Denmark Pink Pearl	Guernsey	5445	21-5-36	24-7-38	273	15	5,655	4·92	277·90	Denmark Research Station	Koojan Golden Prosper (2283)
Wooroloo Freda II. ..	A.I.S.	23245	9 10-35	27-3-38	273	19	6,447	4·23	272·42	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Wooroloo Rose IV.	do.	23269	2-1-36	8-3-38	273	18·5	6,551	4·15	272·29	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
The Wold Starbright Princess	Jersey	64562	4-6-36	11-5-38	273	5·5	4,742	5·68	269·45	L. C. Field	Grantham Air Prince II. (10657)

The Wold Princess Daisy	Jersey	....	7-8-36	11-6-38	240	10·5	4,208	6·34	266·88	L. C. Field	Grantham Air Prince II. (10657)
Brookfields Golden Queen II.	Guernsey	5323	10-2-36	16-11-37	273	16	5,131	5·18	266·16	P. G. Hampshire	Koojan Ace's Majestic (2735)
Grass Vale Golden Cream 15th	Jersey	....	3-9-36	27-7-38	240	8·5	4,680	5·68	265·77	R. H. Rose	Selsey Gay Boy (15134)
Radyr Park Clarionette	do.	....	9-2-36	13-7-38	273	11·5	4,520	5·85	264·65	L. Temple	Graceful Lad of Greenmount (7292)
Crantock Napoleon's Primula III.	do.	....	21-6-36	15-3-38	273	17	6,235	4·23	263·84	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Denmark Prosperette	Guernsey	5446	17-5-36	14-6-38	273	15	5,265	4·98	262·16	Denmark Research Station	Denmark Damon (2519)
Grantham Air Lady III.	Jersey	61950	28-4-36	29-5-38	273	7·5	4,283	6·09	258·51	J. A. Sears	Greenmount Black Prince (6511)
Denmark Diana	Guernsey	6963	28-6-36	19-6-38	273	14	4,932	5·22	257·39	Denmark Research Station	Denmark Damon (2519)
Rutherwood Rosella	do.	7828	14-8-36	8-10-38	273	14	4,347	5·91	256·87	Misses Rutherford	Denmark Rosa's Prosper (2639)
Denmark Rosette	do.	6972	21-7-36	4-7-38	273	9	4,887	5·22	255·17	Denmark Research Station	Koojan Golden Prosper (2283)
Congelin Velveteen	Jersey	....	4-12-36	5-9-38	273	15	4,673	5·47	254·99	B. P. Hack	Rosecliff Sybil's Mariposa (9997)
The Wold Northwood Crescendo	do.	64559	16-4-36	15-5-38	273	6·5	4,100	6·21	254·44	L. C. Field	Grantham Air Prince II. (10657)
Westby Lupin V.	A.I.S.	23138	23-11-35	27-2-38	273	17	5,976	4·21	252·40	Bayley Bros.	Telyarüp Duke (956)
Radyr Park Dorothy V.	Jersey	....	18-7-36	10-7-38	273	11	4,473	5·61	251·03	L. Temple	Greenmount Graceful Lad (7292)
Brookfields Lady Charity	Guernsey	....	27-1-36	13-11-37	273	12	4,461	5·62	250·62	P. G. Hampshire	Koojan Ace's Majestic (2735)
Colmyn Bessie	Jersey	61136	20-5-36	3-7-38	273	12·5	5,303	4·69	248·82	C. H. Ironmonger	Colmyn Prince Victor (10492)
Denmark Velda	Guernsey	6973	13-7-36	23-8-38	273	10	5,160	4·74	244·50	Denmark Research Station	Denmark Damon (2519)
Congelin Rose Marie II.	Jersey	....	2-5-36	9-3-38	273	13	4,254	5·74	244·02	B. P. Hack	Clarendon Eyre Oxford Gamboge (10274)
Claremont Hilda V.	A.I.S.	19598	16-11-35	16-5-38	273	20	6,390	3·82	243·98	Claremont Hospital for Insane	Claremont Herdsman (968)
Lansdowne Dairy Miss IV.	Guernsey	5680	24-11-35	21-10-37	273	15	4,575	5·33	243·92	J. R. Giles	Koojan Ace's Aristocrat (2730)
					365	20	6,240	5·58	347·96		
Yanget Treasure II.	A.I.S.	23314	29-4-36	19-9-38	273	19	6,162	3·94	243·01	A. E. Grant	Sunrise of Parkview (1875)
Crantock Napoleon's Primula II.	Jersey	61211	7-7-35	13-12-37	273	13	4,223	5·70	240·92	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Koojan Ace's Marietta	Guernsey	7243	11-9-36	6-5-38	273	10	4,200	5·73	240·56	A. W. Padbury	Koojan Ace's Aristocrat (2730)
Walgett Handsome Girl VII.	Jersey	....	8-4-36	24-4-38	273	6	4,481	5·35	239·98	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Glanavon Daphne II.	A.I.S.	....	15-12-35	20-11-37	273	19	5,937	4·04	239·94	D. Bevan & Sons	Parkview Commodore (306)
Rutherwood Dame	Guernsey	7825	9-7-36	18-6-38	273	14·5	4,889	4·90	239·75	Misses Rutherford	Denmark Damon (2519)
Claremont Cocky 11th	A.I.S.	19597	25-1-36	3-5-38	273	16·5	5,705	4·20	239·57	Claremont Hospital for Insane	Tipperary Virginia's Re-echo (970)
Glanavon Dell II.	do.	....	26-10-35	23-3-38	273	18	6,534	3·65	238·28	D. Bevan & Sons	Parkview Commodore (306)
Glanavon Gold II.	do.	....	7-8-35	20-10-37	273	21	5,523	4·30	237·69	D. Bevan & Sons	Glanavon Nimrod (437)
Glanavon Thelma	do.	....	1-3-36	13-8-38	273	12	5,406	4·39	237·59	D. Bevan & Sons	Glanavon Nimrod (437)
Yanget Victress	do.	18662	29-7-35	22-10-37	273	17	5,639	4·19	236·11	A. E. Grant	Sunrise of Parkview (1875)
Colmyn Topsy	Jersey	....	1-10-36	3-8-38	273	11	5,618	4·19	235·88	C. H. Ironmonger	Colmyn Prince Victor (10492)
Glanavon Gem	A.I.S.	....	18-11-35	5-4-38	273	15	5,115	4·69	235·77	D. Bevan & Sons	Glanavon Nimrod (437)
Glanavon Doris III.	do.	....	14-11-35	18-11-37	273	14	5,562	4·22	234·87	D. Bevan & Sons	Parkview Commodore (306)
Claremont Lily 7th	do.	19599	17-12-35	15-3-38	273	19	6,237	3·75	234·04	Claremont Hospital for Insane	Wooroloo Persimmon (2972)
Yanget Lucky Pendant	do.	23303	25-6-36	9-9-38	240	16	6,630	3·51	232·86	A. E. Grant	Blacklands Lancer (1874)
Walgett Lily	Jersey	64784	9-5-36	12-5-38	273	7·5	4,223	5·45	230·19	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Glanavon Dahlia IV.	A.I.S.	....	4-3-36	23-3-38	273	16	5,688	4·04	230·09	D. Bevan & Sons	Parkview Commodore (306)
Muresk Opal	Guernsey	7646	27-8-36	4-9-38	273	18	4,779	4·78	228·81	Muresk Agricultural College	Minnamurra Plaintiff (1318)
Claremont Maggie 8th	A.I.S.	19604	12-11-35	25-3-38	273	17·5	5,663	4·02	227·47	Claremont Hospital for Insane	Wooroloo Persimmon (2972)
Walgett Handsome Girl VI.	Jersey	....	10-3-36	14-4-38	273	6	3,768	5·98	225·37	C. J. Cunningham	Sabina Vale Betty's Beau (10018)

HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Calving.	No. of Days in Test.	Weight of Milk Last day of Test.	Weight of Milk for period.	Average Test.	Weight of Butter-Fat for period.	Owner.	Sire.
						lb.	lb.	%	lb.		
COWS UNDER 2½ YEARS—STANDARD 230 LBS. BUTTER-FAT.—*continued.*											
Denmark Bonnie	Guernsey	5437	22-7-35	30 9-37	273	12·5	4,808	4·67	224·67	Denmark Research Station	Denmark Damon (2519)
Glanavon Dahlia III.	A.I.S.	....	9-11-35	24-1 38	273	18	5,064	4·27	216·25	D. Bevan & Sons	Parkview Commodore (306)
Travalgan Lady Eion II.	Jersey	59777	29-9-36	5-6-38	273	11	3,708	5·74	212·34	Robinson Bros.	Travalgan Northern Noble (10124)
Claremont Treasure 13th	A.I.S.	....	18-4-36	20 8-38	273	18·5	5,321	3·89	207·27	Claremont Hospital for Insane	Claremont Kandor (1964)
Denmark Golden Day	Guernsey	5440	29-7-35	2-11-37	273	14	4,047	5·06	205·38	Denmark Research Station	Denmark Damon (2519)
Claremont Rachel 10th	A.I.S.	....	23-3-36	19 8-38	240	13	5,070	3·99	202·56	Claremont Hospital for Insane	Claremont Herdsman (968)
Claremont Whitby Maid 24th	do.	19618	24 12-35	9-3 38	273	15	5,115	3·85	197·19	Claremont Hospital for Insane	Wooroloo Persimmon (2972)
Walgett Pride's Lady	Jersey	64785	23 3 36	24 4-38	273	6·5	3,725	5·22	194·39	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Claremont Cleggett 11th	A.I.S.	....	9-6-36	20-8 38	273	14	4,857	3·96	192·28	Claremont Hospital for Insane	Claremont Herdsman (968)
Crantock Napoleon's Daisy	Jersey	61210	26-7-35	22-10-37	273	16	4,023	4·80	192·10	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Wallatin Fussy	A.I.S.	....	27-5 36	12 9-38	240	20	4,515	4·08	184·20	Prowse Bros.	Lemon Grove Myrtle's Heir (1453)
Claremont Biddy 31st	do.	19590	14-1-36	28 4-38	273	11	4,623	3·90	180·36	Claremont Hospital for Insane	Wooroloo Persimmon (2972)
Rutherwood Jonquil	Guernsey	6263	18 5-36	18-3-38	273	12	3,299	5·38	177·40	Misses Rutherford	Koojan Forty Winks (2738)
Glanavon Tiny II.	A.I.S.	...	15-9 35	28-10-37	240	15	4,320	3·94	170·19	D. Bevan & Sons	Glanavon Nimrod (437)
Congelin Firefly II.	Jersey	....	3 10-36	17-9 38	210	9·5	2,879	5·87	168·71	B. P. Hack	Clarendon Eyre Eminent's Geishar IV. (13597)
Yanget Daphne II.	A.I.S.	23295	6-3 36	24 11-37	273	14	4,290	3·86	165·90	A. E. Grant	Yanget Emperor (2982)
Longridge Melba VI.	do.	....	20-1-37	20 8-38	150	15	3,480	4·62	160·89	R. Bee & Sons	Minathorpe Kitchener (434)
Byrine Blossom	Jersey	....	4-8-36	26-7 38	180	7	3,780	4·09	154·53	E. Loynel	Juadine Robin (11751)
Sabina Vale Water Lily	do.	....	3-7 36	7-5-38	180	13	2,730	5·60	152·31	Sabina Vale Stud Farm	Banyule Ettric (9200)
Brackenhurst Fussy	A.I.S.	19312	30 4-36	5 5-38	180	14	3,360	4·21	141·36	W. G. Burges	Thornleigh Champagne (930)
Byrine Lady Bright	Jersey	....	11-8-36	11-7 38	180	6·5	2,625	4·13	108·42	E. Loynel	Juadine Robin (11751)
Muresk Holly	Guernsey	7639	11 10 36	28-8-38	120	13	2,145	4·37	93·72	Muresk Agricultural College	Koojan Ace's Goldseeker (3431)
Nooka Milkmaid II.	Jersey	....	8-7 36	11 6-38	180	10·5	2,475	3·56	87·98	E. Loynel	Pella O.K. (9913)
Radyr Park Melody II.	do.	....	8 11-36	25-1 39	120	9·5	1,425	6·14	87·90	L. Temple	Radyr Park Lady's Starlight (13128)
Glanavon Doris IV.	A.I.S.	....	24 9-36	3-12-38	120	13	2,250	3·81	85·65	D. Bevan & Sons	Parkview Commodore (306)
Drakesbrook Bubbles	Guernsey	6976	29-8-36	18 8 38	90	16	1,860	4·53	84·33	J. Rae	Drakesbrook Jupiter (4029)
Glanavon Dahlia V.	A.I.S.	....	18-11-36	9-12 38	120	14	2,010	4·05	81·51	D. Bevan & Sons	Parkview Commodore (306)
Glanavon Nancy	do.	....	5 10 36	2 12-38	120	15	2,100	3·80	79·80	D. Bevan & Sons	Glanavon Ponsford (3202)
Nooka Blossom II.	Jersey	....	2-5-36	12-9-38	90	17	2,018	3·73	75·24	E. Loynel	Pella O.K. (9913)
Glanavon Champion II.	A.I.S.	....	14-2-37	17-1 39	90	17	1,890	3·59	67·98	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Westby Pearl IV.	do.	23144	23-11-36	6 3-39	60	27	1,620	4·09	66·21	Bayley Bros.	Telyarup Duke (956)
Westby Lupin 9th	do.	23142	1-12-36	19-3-39	30	36	1,080	4·10	44·16	Bayley Bros.	Telyarup Duke (956)

COWS 2½ YEARS AND UNDER 3 YEARS—STANDARD 250 LBS. BUTTER-FAT.

Koojan Ace's Jean	Guernsey	5660	10-3-36	23-9-38	273	26·5	6,995	5·75	402·04	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)
Tipperary Lady May II.	A.I.S.	18328	8-10-35	25-9-38	273	26	8,868	4·15	367·81	W. G. Burges	Blacklands Monarch's Commander (1877)
Westby Pearl III.	do.	23143	9-1-36	19-7-38	273	24	9,417	3·73	351·69	Bayley Bros.	Telyarup Duke (956)
Westby Carnation II.	do.	18515	12-8-35	12-3-38	273	25	8,250	4·05	334·41	Bayley Bros.	Telyarup Duke (956)
Crantock Golden Duchess	Jersey	...	8-8-35	3-8-38	273	13	6,084	5·40	328·56	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Wattle Creek Viola	A.I.S.	...	15-2-36	17-9-38	273	31	9,063	3·62	328·06	E. T. Thatcher	Tipperary Violet's Monarch (2876)
Lansdowne Dymphna	Guernsey	5683	15-7-35	1-3-38	273	21	6,063	5·35	324·47	J. R. Giles	Koojan Ace's Aristocrat (2730)
Longridge Bess IV	A.I.S.	17202	10-2-35	14-10-37	273	39	8,037	3·98	319·66	R. Bee & Sons	Longridge Carnation's Emblem (2395)
Radyr Park Dorothy IV.	Jersey	63850	5-10-35	12-7-38	273	14	5,397	5·72	308·90	L. Temple	Greenmount Graceful Lad (7292)
Congelin Firefly	do.	...	5-9-35	18-6-38	273	12·5	5,798	5·33	308·82	B. P. Hack	Clarendon Eyre Oxford Dreamer (10273)
Denmark Rose Pearl VII.	Guernsey	5449	17-10-34	2-10-37	273	19·5	6,569	4·73	308·48	G. T. Hill	Koojan Golden Prosper (2283)
Longridge Gentle III.	A.I.S.	21222	20-7-35	1-5-38	273	20	7,380	4·18	308·38	Bee & Sons	Minathorpe Kitchener (434)
Grass Vale Rye Cream III.	Jersey	...	1-10-35	7-6-38	273	15·5	5,267	5·82	306·45	R. H. Rose	Melrose Lost Key (7975)
Sabina Vale Silvermine VII.	do.	64187	18-6-35	15-3-38	240	15	5,640	5·43	306·27	Sabina Vale Stud Farm	Sabina Vale King (12149)
Glanavon Fairy	A.I.S.	20204	22-12-34	6-12-37	273	20	6,990	4·28	299·17	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Summerlea Spangle XI.	do.	App. C.	18-9-35	22-5-38	273	18	7,584	3·94	298·69	Dunkley Bros.	Summerlea Togo (1527)
Grantham Easter Rye IV.	Jersey	57554	18-10-35	18-9-38	273	7	4,776	6·24	297·08	J. A. Sears	Greenmount Black Prince (6511)
Colmyn Janis II.	do.	61139	12-9-35	1-6-38	273	12·5	5,453	5·36	292·30	C. H. Ironmonger	Colmyn Captain Mac (5855)
Radyr Park Melody	do.	59126	26-1-35	18-10-37	273	11·5	4,775	6·02	287·37	L. Temple	Graceful Lad of Greenmount (7292)
Walgett Handsome Girl IV.	do.	59901	5-4-35	24-3-38	240	14·5	5,055	5·59	282·66	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Moorlands Jessamine	do.	....	26-4-35	20-4-38	210	10·5	5,183	5·21	269·88	Estate late P. Rose	Preston Prospector (11024)
Summerlea Dairymaid 21st	A.I.S.	....	2-8-35	28-5-38	273	16	7,428	3·59	266·52	Dunkley Bros.	Summerlea Togo (1527)
Grantham Easter Felicity	Jersey	57555	18-9-35	23-7-38	273	8·5	4,271	6·21	265·21	J. A. Sears	Greenmount Black Prince (6511)
Radyr Park Dorothy III.	do.	59125	15-11-34	18-10-37	273	10	5,070	5·06	256·37	L. Temple	Graceful Lad of Greenmount (7297)
Claremont Mabel 7th	A.I.S.	19603	29-9-35	31-3-38	273	15·5	6,197	4·10	254·30	Claremont Hospital for Insane	Claremont Herdsman (968)
Colmyn Maley	Jersey	....	29-6-35	4-6-38	273	13·5	5,711	4·45	254·20	C. H. Ironmonger	Colmyn Captain Mac (5855)
Grantham Princess Starbright III.	do.	57557	20-9-35	9-8-38	273	10	4,470	5·67	253·33	J. A. Sears	Clarendon Eyre Oxford Pioneer (11484)
Colmyn Peggy	do.	61141	26-10-35	5-7-38	273	12·5	5,731	4·41	252·88	C. H. Ironmonger	Colmyn Captain Mac (5855)
Summerlea Sweet Doris VII.	A.I.S.	App. C.	28-9-35	4-5-38	273	10	6,975	3·61	251·55	Dunkley Bros.	Summerlea Togo (1527)
Wooroloo Maggie	do.	23256	13-11-35	21-8-38	210	21	5,820	4·05	235·53	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
The Wold Air Queen	Jersey	59711	23-5-35	2-5-38	240	14	4,470	4·99	233·16	L. C. Field	Grantham Air Prince II. (10657)
Claremont Cherry 11th	A.I.S.	19595	30-10-35	15-5-38	273	17	5,871	3·86	228·18	Claremont Hospital for Insane	Claremont Herdsman (968)
Walgett Jersey Lily	Jersey	59903	4-5-35	24-3-38	240	11	3,900	5·60	218·55	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Tirano Susie	A.I.S.	22929	1-3-35	13-11-37	273	10	4,565	4·67	213·29	A. Della	Bryn-y-mor Charmer (266)
Capel Daisy III.	Jersey	....	14-9-35	10-6-38	150	21	4,440	4·58	203·22	B. W. Prowse	Devonia Makarini (8217)
Wallatin Pansy	A.I.S.	23058	25-10-35	30-5-38	273	11	4,788	4·15	198·54	Prowse Bros.	Lemon Grove Myrtle's Heir (1453)
Claremont Lucy 8th	do.	....	2-12-35	18-8-37	273	18	5,109	3·89	198·17	Claremont Hospital for Insane	Claremont Herdsman (968)
Claremont Maggie 7th	do.	....	11-10-35	17-7-38	210	22	5,130	3·84	197·07	Claremont Hospital for Insane	Claremont Herdsman (968)
Walgett Joy Bells	Jersey	59904	19-7-35	11-3-38	240	8·5	3,525	5·56	195·96	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Wallatin Lass	A.I.S.	23057	29-10-35	2-9-38	240	20	4,710	4·07	191·61	Prowse Bros.	Lemon Grove Myrtle's Heir (1453)
Glanavon Eva	do.	....	20-11-35	10-6-38	240	13	4,770	3·98	190·02	D. Bevan & Sons	Villiers of Darbalara (2386)
Yanget Lady Thelma	do.	23302	17-3-35	18-10-37	273	17	5,259	3·60	189·36	A. E. Grant	Tipperary Topsy's Monarch (2875)
Capel Gladys Queen II.	Jersey	....	3-9-35	3-5-38	180	19	4,110	4·53	186·15	B. W. Prowse	Capel Carnation's Pride (7988)

HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Calving.	No. of Days in Test.	Weight of Milk Last day of Test.	Weight of Milk for period.	Average Test.	Weight of Butter-Fat for period.	Owner.	Sire.
COWS 2½ YEARS AND UNDER 3 YEARS—STANDARD 250 LBS. BUTTER-FAT—*continued.*											
						lb.	lb.	%	lb.		
Drakesbrook Princess	Guernsey	6986	13–8 35	11–6–38	180	16	3,863	4·61	178·00	J. Rae	Koojan Lord Barclay (1031)
Capel Princess	A.I.S.	19486	22–9–35	28–4 38	210	7·5	3,765	4·21	154·53	B. W. Prowse	Wooroloo Premier VI. (2973)
Yanget Daphne II.	do.	23295	6 3–36	15–9–38	240	7	3,780	3·95	149·34	A. E. Grant	Yanget Emperor (2982)
Brackenhurst Dairymaid	do.	19306	8–11 35	27 5 38	180	19	4,170	3·45	144·09	B. W. Prowse	Thornleigh Champagne (930)
Capel Model	do.	19485	2–8–35	15 6 38	150	20	3,600	3·84	138·33	B. W. Prowse	Thornleigh Champagne (930)
Capel Noraleda II.	Jersey	60992	3–8–35	20–7–38	120	17	2,400	5·28	126·72	B. W. Prowse	Capel Carnation's Pride (7988)
Westby Lupin IV.	A.I.S.	18517	1–8–35	7–3–38	120	16	2,370	4·07	96·42	Bayley Bros.	Telyarup Duke (956)
Drakesbrook Bluebell	Guernsey	6975	11–10–35	25–8–38	90	24·5	2,205	3·91	86·04	J. Rae	Koojan Lord Barclay (1031)
Glanavon Lex	A.I.S.	..	12–2–36	21–12 38	120	15	2,220	3·80	84·27	D. Bevan & Sons	Glanavon Nimrod (437)
Walgett Sweet Duchess	Jersey	59906	23 5–35	19–4–38	60	23·5	1,350	4·08	55·02	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
COWS 3 YEARS AND UNDER 3½ YEARS—STANDARD 270 LBS. BUTTER-FAT.											
Denmark Dawn II.	Guernsey	5439	21–3–35	3–8 38	273	21	8,613	5·61	483·01	Denmark Research Station	Koojan Golden Prosper (2283)
Wooroloo Poppy II.	A.I.S.	23265	4 5–35	29–8–38	273	17·5	10,253	4·19	429·60	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Koojan Ace's Jewel II.	Guernsey	5661	4–3–35	14 4–38	273	21·5	8,207	5·01	411·10	A. W. Padbury	Homestead Ace (imp. U.S.A.) 1631
Tipperary Beauty III.	A.I.S.	18315	8 4 35	18–8 38	273	28	9,459	4·31	407·99	W. G. Burges	Blacklands Monarch's Commander (1877)
Crantock Cream Duchess II.	Jersey	61209	2–8–35	20 8 38	273	17·5	7,193	5·33	383·79	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Norric Peggy	A.I.S.	..	14–4–35	7–7 38	273	19	9,192	4·06	373·10	W. G. Burges	Warwick Rufus (3595)
Wooroloo Dell	do.	18628	18–10 34	8–4–38	273	9	8,742	4·15	362·49	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Greenmount Golden Wonder	Jersey	61975	28–3–35	1 8 38	273	12	6,831	5·29	361·34	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Greenmount Gentle Lady	do.	61973	8–8 35	30 9–38	273	17	6,223	5·79	360·47	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Westby Carnation	A.I.S.	18514	30–5–35	11 9 38	273	23	9,369	3·84	359·95	Bayley Bros.	Telyarup Duke (956)
Congelin Rose Marie	Jersey	61154	5 4–35	12–4–38	273	20·5	6,362	5·61	356·95	B. P. Hack	Rochettes Golden (imp.) (7962)
Wooroloo Bonnie	A.I.S.	18626	29–10 34	16 2–38	273	22	8,721	4·09	356·72	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Brookfields Bonnie Blossom	Guernsey	5319	15 8–34	30–10 37	273	20·5	6,287	5·44	342·05	P. G. Hampshire	Koojan Lord Barclay (1031)
Wooroloo Lady Betty .. .	A.I.S.	18634	3 8 34	20 11–37	273	22	7,686	4·42	340·05	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Wooroloo Sunshine III.	do.	18638	3 1–35	11–4 38	273	21·5	8,120	4·18	339·72	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
Wooroloo Doll	do.	23237	22 4 35	29 5 38	273	19	7,572	4·38	331·76	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
Wooroloo Matilda II. ..	do.	15337	22–5–34	21–11–37	273	28	7,779	4·26	331·24	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
Glanavon Doris II. . ..	do.	20200	30–8–34	19–9–37	273	20·5	7,727	4·28	331·11	D. Bevan & Sons ..	Blacklands Jean's Supreme (1871)

Tipperary Sally	A.I.S.	18338	23-4-35	26-5-38	273	12	8,256	4·00	330·65	W. G. Burges	Blacklands Monarch's Commander (1877)
Glanavon Pink Pearl II. ..	do.	20208	3-9-34	9-11-37	273	16	7,998	4·13	330·48	D. Bevan & Sons .	Blacklands Jean's Supreme (1871)
Glanavon Venus . .	do.	20213	14-10-34	11-11-37	273	20	8,040	4·04	325·04	D. Bevan & Sons . .	Parkview Commodore (306)
Westby Pearl II.	do.	18518	28-2-35	10-7 38	273	20	8,310	3·86	320·96	Bayley Bros.	Telyarup Duke (956)
Denmark Irish Rosette	Guernsey	5442	27-3-35	23-6 38	273	13·5	6,506	4·93	320·49	Misses Rutherford	Denmark Damon (2519)
Tipperary Dove IV.	A.I.S.	18323	18-7-35	10-8-38	273	19	7,197	4·45	319·74	W. G. Burges .	Blacklands Monarch's Commander Duke (1877)
Colmyn Brown Maggie	Jersey	56859	27-6-35	1-8-38	273	11·5	6,605	4·81	317·35	C. H. Ironmonger	Colmyn Prince Victor (10492)
Denmark Golden Day ..	Guernsey	5440	29-7-35	19 9 38	273	16	5,598	5·66	316·72	Denmark Research Station	Denmark Damon (2519)
Longridge Melba III.	A.I.S.	17211	19-6 34	11-11-37	273	24	7,692	4·11	316·60	R. Bee & Sons	Minathorpe Kitchener (434)
Grass Vale Lady Fowler 20th	Jersey	61959	29-5-35	5-8-38	273	12	5,736	5·50	315·54	R. H. Rose	Spring Park Starbright's Sweet Duke (8221)
Congelin Tangerine . ..	do.	61156	13-6-35	9-8-38	273	15	6,293	4·96	312·32	B. P. Hack	Clarendon Eyre Oxford Gamboge (10274)
Glanavon Tiny	A.I.S.	20212	25-9-34	23-10 37	273	23	7,299	4·32	311·74	D. Bevan & Sons ..	Blacklands Jean's Supreme (1871)
Wooroloo Kitty III.	do.	23253	9-7-35	24-9 38	273	26	7,293	4·18	304·95	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Denmark Rose Pearl 8th	Guernsey	5450	23-3-35	30 7-38	273	15	5,813	5·11	296·77	Muresk Agricultural College	Koojan Golden Prosper (2283)
Longridge Royal Lady II.....	A.I.S.	17213	10-10-34	16-10-37	273	27	7,191	4·14	295·10	R. Bee & Sons	Minathorpe Kitchener (434)
Norric Daisy Bell	do.	....	23-4-35	18-9-38	273	11	7,233	4·06	294·00	W. G. Burges	Warwick Rufus (3595)
Wooroloo Yvonne	do.	18639	25-2-35	28 7-38	273	22	6,891	4·22	290·67	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Yanget Victress	do.	18662	29-7-35	1-10-38	240	18	7,110	4·03	286·53	A. E. Grant	Sunrise of Parkview (1875)
Koojan Ace's Twinkle	Guernsey	7244	16-11-34	2-3 38	273	20	5,925	4·82	285·57	J. R. Giles	Koojan Ace (2270)
Brookfields Primrose	do.	5331	24-2-35	28-7 38	210	8·5	5,700	5·01	285·45	W. Darnell	Koojan Ace's Majestic (2735)
Congelin Iolanthe	Jersey	61152	27-3-35	22-5-38	273	12	6,516	4·38	285·28	B. P. Hack	Rochette's Golden (imp.) (7962)
Wooroloo Sunflower	A.I.S.	15348	1-8-34	18 10-37	273	17	6,621	4·29	284·40	Wooroloo Sanatorium Farm	Wooroloo Prince (2974)
Crantock Cream Duchess	Jersey	56952	15-9-34	26-12-37	273	21	4,698	6·00	282·13	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Brookfields Mignonette	Guernsey	5329	18-6-35	9-8-38	240	8	5,535	5·09	282·06	W. Darnell	Koojan Lord Barclay (1031)
Rutherwood Rosette	do.	6265	23-8-34	4-11-37	273	16	5,006	5·59	279·60	Misses Rutherford	Denmark Rosa's Prosper (2639)
Wooroloo Sunflower II.	A.I.S.	18637	3 9-34	25-11 37	273	11	6,168	4·50	277·86	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Walgett Beau's Ruby	Jersey	59900	11-11-34	6-5-38	273	7	5,181	5·35	277·25	C. J. Cunningham	Sabina Vale's Betty's Beau (1008)
Yanget Florrie	A.I.S.	18653	18-3-35	10-9-38	273	17	7,221	3·82	275·65	A. E. Grant	Sunrise of Parkview (1875)
Denmark Rose Ophelia	Guernsey	5448	11-7-35	24-7-38	273	15	5,895	4·61	272·15	Denmark Research Station	Koojan Golden Prosper (2283)
Muresk Tess	do.	6066	15-5-35	4-8 38	273	11·5	5,105	5·28	269·14	P. G. Hampshire	Muresk Homestead (2075)
Denmark Atalie	do.	5436	23-6-34	22-12-37	273	20·5	5,997	5·28	264·03	Misses Rutherford	Koojan Golden Prosper (2283)
Grantham Starbright Queen III.	Jersey	57559	9-8-35	19-9 38	273	10·5	4,352	6·03	262·33	J. A. Sears	Greenmount Black Prince (6511)
Glanavon Esmeralda II.	A.I.S.	20203	11-3-35	5-7-38	273	13	7,149	3·51	251·22	D. Bevan & Sons	Parkview Commodore (306)
Moorlands Josephine	Jersey	....	24-5-35	28-5-38	210	10·5	4,170	5·35	223·02	Estate late P. Rose	Preston Prospector (11024)
Tipperary Jeanette	A.I.S.	18327	29-7-35	7-8-38	273	8	5,094	4·15	211·21	W. G. Burges	Blacklands Monarch's Commander (1877)
Tirano Hazel	do.	....	1-2-35	6-5-38	273	14	5,217	4·02	209·95	A. Della	Bryn-y-mor Charmer (266)
Tirano Peggy	do.	....	1-3-35	4-5-38	273	10	4,860	3·93	191·09	A. Della	Tirano Silver II.
Wooroloo Ruby II.	do.	18636	22-10-34	17-2-38	180	16	4,155	4·18	173·94	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Tirano Bella	do.	22918	4-10-35	19-12 38	120	17·5	2,940	3·79	110·79	A. Della	Tirano Kate's Charmer (2877)
Glanavon Cowslip	do.	20198	7-12-34	17-2-38	150	16	2,720	4·05	110·13	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Drakesbrook Joy	Guernsey	6980	29-7-35	2-9-38	90	19	2,430	3·90	94·83	J. Rae	Drakesbrook Byron (2649)

HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Calving.	No. of Days in Test.	Weight of Milk Last day of Test.	Weight of Milk for period.	Average Test.	Weight of Butter-Fat for period.	Owner.	Sire.
COWS 3½ YEARS AND UNDER 4 YEARS—STANDARD 290 LBS. BUTTER-FAT.						lb.	lb.	%	lb.		
Moorlands Italy	Jersey	..	20 7–34	8 4 38	273	14	6,702	5·73	383·72	Estate late P. Rose	Melrose Liberty (7973)
Brookfields Glory	Guernsey	4059	15 3 34	2 1–38	273	22	6,914	5·16	356·95	P. G. Hampshire	Koojan Aces Chancellor (2274)
Brookfields Lady Hope	do.	5325	14-9 34	28 7 38	240	8·5	6,969	5·03	350·54	W. Darnell	Koojan Lord Barclay (1031)
Travalgan Starlight II.	Jersey	55808	4-9-34	30–5 38	273	16	6,243	5·52	344·91	Robinson Bros.	Travalgan Northern Noble (10124)
Claremont Cherry 8th	A.I.S.	19551	11 9-34	1–8–38	273	26	9,378	3·65	342·50	Claremont Hospital for Insane	Claremont Herdsman (968)
Muresk Flossie	Guernsey	6050	5 7 34	4 7 38	273	18	6,684	5·11	341·48	J. R. Giles	Triumph of Wollongbar (513)
Colmyn Pearl	Jersey	52319	25-11 34	3 6–38	273	14	6,057	5·33	323·11	C. H. Ironmonger	Colmyn Captain Mac (5855)
Longridge Handsome	A.I.S.	17209	2 1–34	9–11 37	273	23	7,494	4·25	318·79	R. Bee & Sons	Minathorpe Kitchener (434)
Brookfields Golden Queen	Guernsey	4060	5 1 34	16 11–37	273	23	6,707	4·69	314·86	P. G. Hampshire	Koojan Lord Barclay (1031)
Colmyn Violet	Jersey	52324	6–10 34	4 8–38	273	10	6,330	4·95	313·35	C. H. Ironmonger	Colmyn Prince Victor (10492)
Brookfields Lady Lynette	Guernsey	5327	21–7–34	10 7 38	240	5·5	6,450	4·82	310·71	W. Darnell	Koojan Lord Barclay (1031)
Colmyn Noraleeda II.	Jersey	52318	1 8–34	29 3 38	273	18·5	6,371	4·8	305·95	C. H. Ironmonger	Colmyn Captain Mac (5855)
Moorlands Iliad	do.		12 6 34	16 5–38	210	12	5,400	5·61	303·03	Estate late P. Rose	Melrose Liberty (7973)
The Wold Merry Daisy	do.	55528	14–8–34	27 5 38	240	12·5	5,075	5·76	292·59	L. C. Field	Merry King of Greenmount (4306)
Wooroloo Elsie II.	A.I.S.	18629	30 10–34	7–6 38	273	19	6,927	4·21	291·70	Wooroloo Sanatorium Farm	Triumph of Pine Creek (2515)
Glanavon Irene	do.	20207	22 8 34	13 6–38	273	14	6,372	4·41	280·85	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Muresk Moss Rose	Guernsey	6060	17–8–34	26 4 38	273	11	4,608	5·65	260·18	Muresk Agricultural College	Minnamurra Plaintiff (1318)
Glanavon Vera	A.I.S.	16494	14 1 34	18 10–37	273	13	5,919	4·29	253·92	E. T. Thatcher	Glanavon Nimrod (437)
Glanavon Rosalie	do.	20210	12 2 35	17 9 38	273	19	7,107	3·56	253·40	D. Bevan & Sons	Parkview Commodore (306)
Westby Polly III.	do.	18519	4 10–34	23 8 38	273	6	5,546	4·25	235·86	Bayley Bros.	Telyarup Duke (956)
Capel Gladys Queen I.	Jersey	60990	21 9–34	20–6–38	150	21·5	4,275	5·28	225·66	B. W. Prowse	Capel Carnation's Pride (7988)
Moorlands Idela	do.		14–10 34	26 4 38	210	4·5	4,050	5·44	220·35	Estate late P. Rose	Preston Prospector (12024)
Tirano Camellia	A.I.S.	18340	13–4–34	13–12 37	273	12	5,421	4·06	219·93	A. Della	Tirano Silver King (1525)
Selsey Ranunculus	Jersey	55209	13 8 34	30–4–38	120	28	3,945	5·52	218·07	Robinson Bros.	Brampton Great Boy (imp.)(9137)
The Wold Merry Northwood	do.	55529	17 8 34	1 6 38	210	9·5	3,840	5·67	217·56	L. C. Field	Merry King of Greenmount (4306)
Leylands Fairy	A.I.S.	17164	2–7–34	6 4 38	273	11	4,323	4·05	175·02	Prowse Bros.	Thornleigh Champagne (930)
Juadine Sparkle 11th	Jersey	57870	14 8–34	7–5 38	210	12	4,290	3·99	171·47	B. P. Hack	Juadine Sunshine (8212)
Tirano Mabel	A.I.S.	18341	12–11 34	9 10–38	180	17	3,570	4·11	146·73	A. Della	Bryn-y-mor Charmer (266)
Capel Pretty I.	Jersey	56710	16–8 34	20 7 38	120	21	3,090	4·47	138·78	B. W. Prowse	Devonia Makarini (8217)
Selsey Wyandotte III.	do.	55215	14 8–34	5–5–38	80	21	2,130	6·47	137·94	Robinson Bros.	Brampton Great Boy (imp) (9137)
Leylands Red Rose	A.I.S.	21182	12 8 34	20 6–38	90	27	3,090	3·06	109·98	B. W. Prowse	Widgee Waa Record (848)
Muresk Pearl	Guernsey	6062	11–7–34	3 3 38	120	16	2,205	4·63	101·88	Muresk Agricultural College	Muresk Homestead (2075)
Crantock Golden Cream	Jersey	52397	27 6 34	24 1–38	150	4	1,410	5·87	82·74	Mrs. G. H. Burnside	Crantock Blondes Napoleon (8207)
COWS 4 YEARS AND UNDER 4½ YEARS—STANDARD 310 LBS. BUTTER-FAT.											
Tipperary Beauty II.	A.I.S.	18314	8 4 34	8 8–38	273	18	11,499	4·10	471·59	W. G. Burges	Blacklands Monarch's Commander (1877)
Lansdowne Joyce	Guernsey	4361	17 3 34	1 5 38	273	27	8,826	4·92	434·46	J. R. Giles	Koojan Ace's Advocate (2272)
					365	17	10,360	4·90	508·17		
Newstead Lovely 20th	A.I.S.	17585	19–2–34	13–3–38	273	30	10,530	4·12	433·03	W. G. Burges	Renown of Newstead (3077)

Westby Lupin III.	do.	18516	31-8-34	14-9-38	273	13	10,629	3·94	419·27	Bayley Bros.	Telyarup Duke (956)
Selsey Attraction	Jersey	55203	16-7-34	28-7-38	273	16	5,808	6·70	389·26	Robinson Bros.	Brampton Great Boy (imp.) (9317)
Koojan Ace's Daphne	Guernsey	5657	13-8-34	13-9-38	273	27·5	7,178	5·19	372·84	A. W. Padbury	Koojan Ace (2270)
Wooroloo Gold	A.I.S.	18632	31-1-34	9-5-38	273	19	8,517	4·13	351·68	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Leylands Melba	do.	17170	1-9-33	26-12-37	273	12	7,746	4·41	341·41	D. Bevan & Sons	Widgee Waa Record (848)
Westby Polly II.	do.	15142	1-12-33	25-4-38	273	25	9,225	3·69	341·00	Bayley Bros.	Telyarup Duke (956)
Claremont Maggie Morrison 14th	do.	15965	14-9-33	21-12-37	273	15	8,790	3·84	337·95	Claremont Hospital for Insane	Claremont Herdsman (968)
Leylands Radium	do.	17176	15-3-34	4-5-38	273	15	8,025	3·94	315·94	Prowse Bros.	Widgee Waa Record (848)
Tipperary Dove	do.	18320	21-4-34	29-5-38	273	20	7,170	4·40	315·69	W. G. Burges	Blacklands Monarch's Commander (1877)
Westby Primrose	do.	18520	7-9-34	12-9-38	273	13	8,199	3·81	312·56	Bayley Bros.	Telyarup Duke (956)
Summerlea Dairymaid 16th	do.	18123	28-1 34	18-4-38	273	23	8,642	3·58	309·44	Dunkley Bros.	Summerlea Supreme (973)
Leylands Tiny	do.	17181	24-2-34	18-4-38	273	18	7,869	3·91	308·02	Prowse Bros.	Parkview Commodore (306)
Colmyn Daisy	Jersey	47679	25-10-33	2-3-38	273	19·5	5,444	5·58	303·84	C. H. Ironmonger	Colmyn Captain Mac (5855)
Lemon Grove Dora 8th	A.I.S.	17141	12-12 33	16-4-38	273	19	7,617	3·94	300·23	Prowse Bros.	Dan of Greyleigh (97)
Wooroloo Milkmaid 5th	do.	15339	2-1-34	14-1-38	273	24	7,452	4·02	299·91	E. T. Thatcher	Parkview Guardian (2557)
Greenmount Joyful Maid	Jersey	53052	13-3-34	19-3-38	273	10·5	5,357	5·48	293·65	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9224)
Summerlea Lady V.	A.I.S.	App. C.	23-5-33	15-6-38	273	16	7,871	3·55	279·36	Dunkley Bros.	Summerlea Togo (1527)
Claremont Mavis IV.	do.	15968	7-5-34	13-8-38	273	9	6,627	3·79	249·99	Claremont Hospital for Insane	Tipperary Virginia's Re-echo (970)
Moorlands Ione	Jersey	....	27 3-34	12-7-38	180	9	4,868	4·99	242·76	Estate Late P. Rose	Melrose Liberty (7973)
Capel Centenary Girl III.	do.	56707	3-3-34	1-5-38	210	8	3,915	5·84	228·75	B. W. Prowse	Capel Carnation's Pride (7988)
Wooroloo Joy	A.I.S.	15333	10-4-34	2-9-38	180	14	4,310	5·01	216·02	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Tirano Violet	do.	22930	5 10 33	19-9-38	180	18·5	4,373	4·38	191·55	A. Della	Bryn-y-mor Charmer (266)
Capel Noraleda	Jersey	56709	7 3-34	1-7-38	120	28	3,758	4·63	171·57	B. W. Prowse	Capel Carnation's Pride (7988)
Tirano Betty	A.I.S.	22919	7-10-33	2-4-38	210	10	4,200	4·08	171·30	A. Della	Bryn-y-mor Charmer (266)
Drakesbrook Thelma	Guernsey	4146	26-4-34	8-8-38	120	23	3,255	4·60	149·70	J. Rae	Koojan Ace's Chancellor (2274)

COWS 4½ YEARS AND UNDER 5 YEARS—STANDARD 330 LBS. BUTTER-FAT.

Greenmount Sweet Lass	Jersey	44204	14-7-33	13-3-38	273	24·5	8,572	5·76	494·03	A. J. B. Strempel	Bellefaire Bonaparte's Bonetienne (9244)
Koojan Golden Butterfly	Guernsey	4339	18-4-33	23-3-38	273	19	8,652	5·34	462·55	A. W. Padbury	Koojan Ace (2270)
Tabbagong Dove 11th	A.I.S.	12241	22-7 33	25-3-38	273	27	11,061	4·11	454·38	W. G. Burges	Parkview Reward II. (260)
Leylands Daphne	do.	12252	2 8-33	26-6-38	273	31	10848	4·02	436·51	B. W. Prowse	Widgee Waa Record (848)
Koojan Ace's Pixie	Guernsey	4336	11-4-33	24-3-38	273	22	8,376	5·12	429·30	A. W. Padbury	Homestead Ace (1631)
Claremont Star 12th	A.I.S.	9947	3-9-33	12-7-38	273	22·5	10,958	3·73	408·50	Claremont Hospital for Insane	Tipperary Daphne's Boy (449)
Lansdowne Bonny Blossom II.	Guernsey	4351	6 8-33	28-4-38	273	20	7,890	4·81	379·89	J. R. Giles	Koojan Ace's Advocate (2272)
Lemon Grove Fussy 6th	A.I.S.	17144	10-5-33	5-5-38	273	13·5	9,146	3·94	359·98	Prowse Bros.	Alne Bank Lady's Gift (760)
Walgett Water Lily	Jersey	51066	28-8-33	24-4-38	273	13·5	8,501	4·18	355·76	C. J. Cunningham	Mokine Centenary (7595)
Lemon Grove Pride 8th	A.I.S.	17150	20-7-33	27-3-38	273	16	8,313	3·97	331·19	Prowse Bros.	Alne Bank Lady's Gift (760)
Brookdale Butterfly	Jersey	52028	29-6-33	20-4-38	273	15	6,645	4·96	329·90	B. P. Hack	Brookvale Noble Boy (7278)
Grass Vale Twylish Eve	do.	61960	17 10-33	22-6-38	240	11	6,210	5·27	327·21	R. H. Rose	Banyule Silvermine's Twylish (7600)
Lemon Grove Gracie 11th	A.I.S.	17148	10 8-33	24-4-38	273	15	7,950	4·09	324·99	Prowse Bros.	Greyleigh Archer (571)
Greyleigh Cinderella 28th	do.	16705	4-7-33	1-6-38	273	21	8,037	3·97	317·61	Prowse Bros.	Quenton of Greyleigh (1472)
Lemon Grove Gladys 10th	do.	17147	14-8-33	9-6-38	273	14	8,022	3·96	317·60	Prowse Bros.	Dan of Greyleigh (97)
Summerlea Swallow IV.	do.	18138	27-6-33	2-5-38	273	17·5	8,813	3·57	314·72	Dunkley Bros.	Kitchener of Summerlea (971)
Grass Vale Golden Cream 10th	Jersey	48535	7 10-33	1-7-38	273	11	5,478	5·73	313·76	R. H. Rose	Banyule Silvermine's Twylish (7600)
Walgett Joy	do.	51064	8-7-33	29-4-38	273	5·5	5,432	5·74	311·67	C. J. Cunningham	Mokine Centenary (7595)
Summerlea Lady IV.	A.I.S.	App. C.	15-5-33	16-4-38	273	12	7,956	3·77	301·10	Dunkley Bros.	Summerlea Supreme (973)

HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Calving.	No. of Days in Test.	Weight of Milk Last day of Test.	Weight of Milk for period.	Average Test.	Weight of Butter-Fat for period.	Owner.	Sire.
						lb.	lb.	%	lb.		
COWS 4½ YEARS AND UNDER 5 YEARS—STANDARD 330 LBS. BUTTER-FAT—*continued.*											
Leylands Model	do.	12254	12-8-33	4-7-38	210	28·5	7,680	3·79	291·60	B. W. Prowse	Widgee Waa Record (848)
Lemon Grove Buttercup 25th	do.	17136	25-7-33	16-7-38	273	11	6,888	4·02	277·13	Prowse Bros.	Alne Bank Lady's Gift (760)
Tirano Rosie	do.	22928	16-6-33	16-2-38	273	6	6,408	4·00	255·68	A. Della	Bryn-y-mor Charmer (266)
Drakesbrook Pride	Guernsey	4145	16-10-33	26-4-38	210	20·5	4,905	4·47	219·45	J. Rae	Koojan Lord Barclay (1031)
Yanget Duchess II.	A.I.S.	15410	10-5-34	25-8-38	210	12	5,490	3·71	203·82	A. E. Grant	Sunrise of Parkview (1875)
Tirano Violet	do.	22930	5-10-33	19-9-38	180	18·5	4,373	4·38	191·55	A. Della	Bryn-y-mor Charmer (266)
Juadine Sparkle 8th	Jersey	48876	26-7-33	15-7-38	180	11·5	3,525	4·36	153·15	E. Loynel	Juadine Sunshine (8212)
Leylands Princess	A.I.S.	12255	21-10-33	14-7-38	120	23	3,750	3·81	143·01	B. W. Prowse	Mayflower's Emblem of Hillview (955)
COWS 5 YEARS AND OVER—STANDARD 350 LBS. BUTTER-FAT.											
Moorlands Happy	Jersey	54219	3-4-33	5-5-38	273	10·5	8,762	6·01	526·43	Estate late P. Rose	Melrose Liberty (7973)
Lansdowne Morden Lady	Guernsey	3479	10-11-31	12-9-38	273	27·5	9,296	5·38	500·23	P. G. Hampshire	Koojan Golden Broadcaster (1632)
Koojan Lady Olive	do.	4340	11-2-33	25-3-38	273	24	9,537	5·14	490·61	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)
Summerlea Empress VII.	A.I.S.	14127	20-8-32	9-5-38	273	26	10,773	4·30	463·49	Dunkley Bros.	Summerlea Searchlight (972)
New Park Sally 9th	do.	1873	30-4-29	18-5-38	273	18	12,774	3·79	459·38	W. G. Burges	Ruler of Greyleigh (1855)
Tabbagong Dove 8th	do.	7511	19-12-31	5-4-38	273	30	10,965	4·17	456·96	W. G. Burges	Parkview Reward II. (260)
Koojan Bonnie Evelyn	Guernsey	3899	7-4-32	27-8-38	273	23	8,064	5·47	441·52	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)
Denmark Golden Marie	do.	3873	26-4-32	1-8-38	273	18	7,824	5·59	437·03	Denmark Research Station	Koojan Golden Prosper (2283)
Koojan Ace's Jewel	do.	4333	19-2-33	13-3-38	273	17	8,556	5·09	435·86	A. W. Padbury	Homestead Ace (imp. U.S.A.) (1631)
Wooroloo Duchess II.	A.I.S.	15324	15-8-32	21-7-38	273	19	10,287	4·23	435·72	E. T. Thatcher	Triumph of Pine Creek (2515)
Blacklands Beauty 10th	do.	9279	2-4-32	27-8-38	273	18	10,472	4·12	431·03	W. G. Burges	Fussy's Monarch of Hillview (493)
Crantock Cream Lass	Jersey	43542	7-6-31	31-7-38	273	16	7,353	5·81	427·34	Mrs. G. H. Burnside	Crantock Starbright's Montrose (5945)
Crantock Starbright's Napoleonette	do.	52400	27-11-32	21-7-38	273	16·5	7,033	6·04	425·12	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (8207)
Lottie III. of Marks Villa	A.I.S.	16484	10-11-28	5-8-38	273	15·5	10,382	4·06	421·57	B. W. Prowse	Marks Villa Dina's Lad
Westby Pearl	do.	15140	19-2-33	1-4-38	273	30·5	10,487	4·01	420·59	Bayley Bros.	Telyarup Duke (956)
Radyr Park Clarion Call	Jersey	45843	5-7-31	13-9-38	273	17·5	6,938	6·06	420·56	L. Temple	Melrose Clarion (6931)
Koojan Dame	Guernsey	1252	18-6-24	17-6-38	273	28	10,254	4·10	420·38	Denmark Research Station	Robin of Nundorah (417)
Coolup Gladys II.	Jersey	39353	1-5-30	9-9-38	273	27	8,661	4·83	418·29	B. W. Prowse	Fairy's Duke II. of Grassvale (7168)
Karridale Pride	Guernsey	1981	16-10-27	20-8-38	273	15	7,875	5·17	407·07	P. G. Hampshire	Minnamurra Oliver Twist (528)
Summerlea Red Rose III.	A.I.S.	14253	24-5-31	17-4-38	273	24	10,401	3·91	406·66	Dunkley Bros.	Summerlea Searchlight (972)
Beauna Vista Fairy V.	do.	1322	8-12-29	4-5-38	273	17	10,581	3·74	405·99	Prowse Bros.	Spearfelt of Alne Bank (1029)
Crantock Lady Bluebell	Jersey	34724	26-5-29	19-6-38	273	11	6,453	6·29	405·89	Mrs. G. H. Burnside	Crantock Starbright's Chief (5790)
Greenmount Starbright Marinora	do.	34841	31-5-30	30-7-38	273	16·5	7,100	5·69	404·58	A. J. B. Strempel	Werribee Starbright's King (2602)
Kudardup Pansy	Guernsey	2927	16-1-31	1-5-38	273	14	6,897	5·75	396·60	J. R. Giles	Newry Golden Prince (977)
Summerlea Spangle 3rd.	A.I.S.	App. C.	15-10-30	25-5-38	273	16·5	10,493	3·71	389·55	Dunkley Bros.	Victor of Telyarup (2498)
Newstead Daisy 12th	do.	12955	28-5-30	27-1-38	273	25	9,165	4·24	388·37	W. G. Burges	Superb of Newstead (2911)
Denmark Rosebud	Guernsey	3876	14-3-32	2-5-38	273	19	7,077	5·33	387·67	Denmark Research Station	Wollongbar McQuarrie
Summerlea Sweet Doris II.	A.I.S.	App. D.	18-3-28	5-5-38	273	26	11,943	3·24	386·63	Dunkley Bros.	Musket of Claremont (Vol. 8, found)

Newry Lady Freda	Guernsey	2719	13-9-28	12-9-38	273	10	6,945	5·56	386·11	P. G. Hampshire	Koojan Mac (596)
Crantock Lady Primrose	Jersey	52398	10-6-31	20-5-38	273	17	6,524	5·78	376·96	Mrs. G. H. Burnside	Crantock Starbright's Montrose (5945)
Westly Lupin	A.I.S.	15138	28-3-32	4-8-38	273	18	10,494	3·58	376·09	Bayley Bros.	Telyarup Duke (956)
Crantock Cream Star	Jersey	34723	14-8-28	7-7-38	273	12	6,141	6·09	373·93	Mrs. G. H. Burnside	Crantock Starbright's Chief (5790)
Wyuna Lady Dawn	Guernsey	2472	12-11-29	16-6-38	273	16	7,428	4·95	367·85	Denmark Research Station	Nundorah Prosper (664)
Karridale Lady Biddy	do.	2332	29-5-28	1-7-38	273	17	8,301	4·43	367·43	J. R. Giles	Minnamurra Oliver Twist (528)
Illawah Limerick Lass II.	A.I.S.	5016	14-9-29	23-3-38	273	23	8,144	4·50	366·73	Prowse Bros.	Sentinel of Greyleigh (1647)
Grangelea Pretty Primrose	Jersey	33038	31-10-29	25-3-38	210	26	6,075	5·99	363·96	Sabina Vale Stud Farm	Banyule Airo (5751)
Muresk Dessie	Guernsey	4722	20-4-33	9-7-38	273	16	7,435	4·88	363·04	Muresk Agricultural College	Triumph of Wollongbar (513)
Denmark Orangebud	do.	4123	9-8-32	18-10-37	273	26	8,748	4·15	363·01	Denmark Research Station	Koojan Golden Prosper (2283)
Illawah Le III.	A.I.S.	11797	15-2-33	28-3-38	273	24	9,912	3·58	356·66	D. Bevan & Sons	Illawah Veteran's Hope (822)
Grass Vale Golden Cream 7th	Jersey	44182	19-7-32	9-6-38	273	10	6,300	5·63	354·92	R. H. Rose	Banyule Silvermine's Twylish (7600)
Westby Polly	A.I.S.	15141	21-5-32	25-1-38	273	35	9,510	3·71	352·71	Bayley Bros.	Telyarup Duke (956)
Moorlands Dot	Jersey	31236	16-5-29	5-7-38	273	11	7,278	4·84	352·40	L. Temple	Melrose Romeo (5861)
Denmark Golden Dawn	Guernsey	4118	9-1-33	16-5-38	273	13	5,889	5·93	349·26	Denmark Research Station	Koojan Golden Prosper (2283)
Crantock Lady Buttercup	Jersey	39439	21-5-30	20-9-38	273	20	6,030	5·77	347·89	Mrs. G. H. Burnside	Crantock Starbright's Montrose (5945)
Brookfields Lady Faith	Guernsey	4062	19-6-32	3-1-38	273	24·5	6,722	5·11	343·46	P. G. Hampshire	Koojan Lord Barklay (1031)
					365	22·5	8,981	5·26	472·97		
Clarendon Eyre Tangerine VI	Jersey	43396	4-2-32	7-6-38	273	13·5	6,791	5·03	341·90	B. P. Hack	Rochette's Golden (imp.) (7962)
Lansdowne Dorothy	Guernsey	4359	27-7-33	25-7-38	273	18	7,644	4·47	341·85	J. R. Giles	Koojan Ace's Advocate (2272)
Denmark Prosper's Rosa	do.	4127	27-12-32	13-5-38	273	20	6,420	5·32	341·62	Denmark Research Station	Koojan Golden Prosper (2283)
Grantham Easter Fairy	Jersey	34825	18-9-31	9-6-38	240	18·5	6,045	5·62	339·60	J. A. Sears	Greenmount Black Prince (6511)
Summerlea Milkmaid III.	A.I.S.	App. D.	19-3-28	17-4-38	273	14	9,702	3·47	337·18	Dunkley Bros.	Musket of Claremont (Vol. 8, found)
Swanlea Lovely 7th	do.	4284	12-2-31	18-4-38	273	27	9,471	3·55	336·54	A. E. Grant	Headlight of Parkview (1406)
Westby Ulery	do.	15143	15-6-33	11-8-38	273	5	9,735	3·44	335·22	Bayley Bros.	Telyarup Duke (956)
Beauna Vista Tiny 18th	do.	4221	24-6-30	10-6-38	273	20	8,610	3·86	332·96	Prowse Bros.	Spearfelt of Alne Bank (1029)
Koojan Daffodil	Guernsey	2231	4-10-28	11-9-38	273	14·5	6,389	5·04	322·01	Misses Rutherford	Koojan Golden Governor (595)
Radyr Park Clarion Call	Jersey	45843	5-7-31	21-10-37	273	11·5	5,465	5·88	321·22	L. Temple	Melrose Clarion (6931)
Longridge Blanche	A.I.S.	7664	12-4-32	19-12-37	273	24	7,842	4·09	321·00	R. Bee & Sons	Minathorpe Kitchener (434)
Blacklands Pretty Maid VI.	do.	9376	25-2-32	28-10-37	210	22	8,408	3·82	320·87	A. E. Grant	Orama of Blacklands (1905)
The Wold Starbright Grey II.	Jersey	46430	17-4-33	23-6-38	240	14	7,735	4·07	315·03	L. C. Field	Lonswood Lord Grey (7291)
Radyr Park Laddie's Estrellita	do.	45846	16-7-32	12-6-38	273	12	5,241	5·97	312·78	L. Temple	Graceful Lad of Greenmount (7292)
Glanavon Sunbeam III.	A.I.S.	10929	16-10-32	20-9-38	273	19	7,617	4·10	312·65	D. Bevan & Sons	Glanavon Nimrod (437)
Walgett Handsome Girl I.	Jersey	42402	1-12-31	21-4-38	273	5·5	5,882	5·30	311·85	C. J. Cunningham	Burekup Campanile's Duke (7287)
Grass Vale Lady Fowler 17th	do.	48536	6-5-33	27-6-38	240	12·5	5,325	5·79	308·34	R. H. Rose	Banyule Silvermine's Twylish (7600)
Numbawarra Silky III.	A.I.S.	17626	28-8-32	2-5-38	273	17	7,941	3·87	307 01	Prowse Bros.	Jellicoe of Fairfield (1136)
Wingeewah Kate III.	do.	1535	20-3-29	4-4-38	273	23	7,944	3·80	302·10	A. Della	Daphne's Defiance of Hillview (Vol. 8, found)
Blacklands Daphne 7th	do.	9291	18-10-32	15-3-38	273	19	8,255	3·64	300·86	A. E. Grant	Fussy's Monarch of Hillview (493)
The Wold Northwood Grey	Jersey	42214	15-5-32	15-4-38	273	11·5	5,390	5·58	300·57	L. C. Field	Lonswood Lord Grey (7291)
Wingeewah Winnie 7th	A.I.S.	4395	20-3-30	24-6-38	273	23	7,250	4·13	299·57	A. E. Grant	Daphne's Defiance of Hillview (Vol. 8, found)
Hillview Fussy 34th	do.	4496	3-9-30	31-10-37	273	8	9,099	3·28	299·27	A. E. Grant	Limelight of Hillview (954)
Minnamurra Currency Lass	Guernsey	2606	27-10-29	18-3-38	273	15	5,925	5·03	297·99	Muresk Agricultural College	Caramana Favour (652)

HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Calving.	No. of Days in Test.	Weight of Milk Last day of Test.	Weight of Milk for period.	Average Test.	Weight of Butter-Fat for period.	Owner.	Sire.
COWS 5 YEARS AND OVER—STANDARD 350 LBS. BUTTER-FAT—*continued.*											
						lb.	lb.	%	lb.		
Sabina Vale Ruby's Lass	Jersey	50538	5-4-32	10-3-38	240	18·5	5,310	5·57	296·07	Sabina Vale Stud Farm	Clarendon Eyre Ruby's Beau (7963)
Walgett Handsome Girl 3rd	do.	51063	12-11-32	21-4-38	273	7	5,616	5·22	293·28	C. J. Cunningham	Mokine Centenary (7595)
Minnamurra Eleanor	Guernsey	2607	13-8-29	26-7-38	273	12	6,516	4·48	292·27	Muresk Agricultural College	Caramana Favour (652)
Denmark Rosa III. ...	do.	2523	5-4-29	2-10-38	210	15	6,030	4·78	288·48	Denmark Research Station	Wollongbar Reformer (538)
Moorlands Glide	Jersey	45237	5-8-32	12-6-38	210	10·5	5,310	5·42	287·94	Estate late P. Rose	Melrose Clarion (6931)
The Wold Daisy Grey II. ...	do.	46428	28-3-33	29-5-38	240	14	5,663	5·07	286·98	L. C. Field	Lonswood Lord Grey (7291)
Blacklands Red Queen 8th	A.I.S.	9386	16-10-32	11-6-38	240	12	7,620	3·73	284·16	A. E. Grant	Orama of Blacklands (1905)
Tabbagong Beauty 19th ..	do.	7502	20-12-31	18-5-38	273	5	7,103	3·91	278·10	A. E. Grant	Parkview Reward II. (260)
Swanlea Radium 8th	do.	4990	17-7-31	10-5-38	273	12	7,266	3·79	275·66	Prowse Bros. .	Headlight of Parkview (1406)
Beanna Vista Jocks Tiny ...	do.	9075	25-9-32	11-4-38	240	15	7,470	3·68	275·37	D. Bevan & Sons	Beanna Vista Jock (212)
Walgett Handsome Girl II.	Jersey	51062	12-11-32	2-5-38	273	6	5,253	5·09	267·80	C. J. Cunningham ..	Mokine Centenary (7595)
Walgett Duchess	do.	42400	20-8-31	21-5-38	273	5	5,100	5·21	266·04	C. J. Cunningham	Burekup Campanile's Duke (7287)
Blacklands Graceful 7th ...	A.I.S.	9318	24-7-32	23-7-38	273	12	7,011	3·37	263·26	A. E. Grant	Orama of Blacklands (1905)
Wingeewah Silver III.	do.	1547	4-10-28	25-7-38	240	15·5	5,910	4·33	256·11	A. Della	Karawarra Werri (2759)
Blacklands Florrie 13th ...	do.	9306	3-12-31	3-5-38	240	20	5,745	4·43	254·43	A. E. Grant	Orama of Blacklands (1905)
Blacklands Daphne 6th	do.	9290	2-11-32	29-7-38	273	9	6,897	3·56	245·88	A. E. Grant	Fussy's Monarch of Hillview (493)
Tirano Princess	do.	7677	22-12-30	19-9-38	180	17	5,085	4·75	241·53	A. Della	Pine Creek Banker (450)
Fairfield Victory's Actress ...	do.	10721	25-9-32	27-5-38	273	16	7,285	3·31	241·24	D. Bevan & Sons	Daphne's Victory of Hillview (1652)
Crantock Lady Buttercup	Jersey	39439	21-5-30	22-10-37	273	8	4,521	5·26	237·78	Mrs. G. H. Burnside	Crantocks Starbright's Montrose (5945)
Wingeewah Melba	A.I.S.	6732	22-4-31	15-2-38	210	20	6,150	3·84	236·01	A. Della	Regent of the Hill (3038)
Denmark Rosa III.	Guernsey	2523	5-4-29	31-10-37	210	8	4,875	4·77	232·53	Denmark Research Station	Wollongbar Reformer (538)
Yanget Pansy II.	A.I.S.	8337	10-8-31	24-5-38	273	13	4,989	4·58	228·56	Prowse Bros.	Yanget Pet's Re-echo (452)
Moorlands Granny	Jersey	....	24-6-32	27-3-38	273	12	4,184	5·46	228·41	E. Loynel	Melrose Clarion (6931)
Blacklands Sadie V.	A.I.S.	9391	26-9-32	26-2-38	240	19	5,730	3·92	224·82	D. Bevan & Sons ..	Blacklands Major (369)
Radyr Park Dorothy II. ...	Jersey	45845	24-7-32	24-10-37	240	6·5	4,463	5·02	223·95	L. Temple .	Graceful Lad of Greenmount (7292)
Koojan Bo-peep	Guernsey	3542	26-2-31	22-2-39	90	44	3,870	5·70	220·86	A. W. Padbury .	Homestead Ace (imp. U.S.A.) (1631)
Tirano Primrose	A.I.S.	22927	25-3-32	14-2-38	273	4·5	4,874	4·36	212·81	A. Della	Bryn-y-mor Charmer (266)
Sabina Vale Silvermine	Jersey	50539	29-3-32	18-5-38	180	23	4,455	4·60	205·74	Sabina Vale Stud Farm	Banyule Lord Silvair (5752)
Koojan Ace's Mignonette ..	Guernsey	3898	23-4-32	10-9-38	120	28	3,960	5·19	205·44	A. W. Padbury .	Homestead Ace (imp. U.S.A.) (1631)
Sabina Vale Blossom	Jersey	50536	28-11-32	21-5-38	150	20	3,930	4·90	195·33	Sabina Vale Stud Farm	Glen Iris Matilda's Lord (9491)
Tipperary Daphne	A.I.S.	5114	5-10-30	8-5-38	180	15	5,205	3·66	190·29	B. W. Prowse ...	Melba's Re-echo of Darbalara (252)
Karridale Patsy	Guernsey	3593	4-1-30	28-4-38	210	14	3,690	4·95	182·67	J. Rae	Minnamurra Betty's Prince (524)
Drakesbrook Golden Kitty	do.	4143	26-2-33	2-7-38	150	20·5	3,675	4·75	174·80	J. Rae ...	Koojan Lord Barklay (1031)
Crantock Blonde Susanette	Jersey	56951	28-10-32	24-11-37	210	13·5	3,180	5·31	168·95	Mrs. G. H. Burnside .	Crantock Blonde's Napoleon (8207)
Cookalabai Tulip	Guernsey	3773	12-10-30	24-4-38	210	12	4,028	4·19	168·94	J. Rae	Cookalabai Pride II. (2456)
Blacklands Myrtle 8th	A.I.S.	9369	3-9-32	5-5-38	120	24	3,848	4·02	154·66	A. E. Grant	Parkview Limelight (370)
Clarendon Eyre Betty	Jersey	39244	28-4-28	5-7-38	120	29·5	3,750	4·10	153·66	Sabina Vale Stud Farm	Clarendon Eyre Eminent's Achievement (4154)
Crantock Blonde Susanette	do.	56951	28-10-32	25-1-39	120	10·5	2,430	5·81	141·26	Mrs. G. H. Burnside	Crantock Blonde's Napoleon (520)
Sabina Vale Countess	do.	55175	27-4-32	21-7-38	90	23·5	2,505	5·60	139·50	Sabina Vale Stud Farm	Bellefaire Seaborn Successor (imp.) (6824)

Fairfield Shirley ...	A.I.S.	6476	3-8-31	12 7 38	120	29	3,870	3·59	139·23	B. W. Prowse	Kinsman 3rd of Greyleigh
Moorlands Gladiola .	Jersey	54218	16 6-32	20-9-38	120	12·5	3,000	4 37	131·10	E. Loynel	Melrose Liberty (7973)
Nooka Red Rose	do.	49858	28 12 32	6 10-38	120	16·5	2,970	4·12	122·34	E. Loynel	Nooka Carnation's King (8214)
Drakesbrook Golden Lassie	Guernsey	3591	13 9 31	3-9-38	90	18	2,100	5·33	112·02	J. Rae	Wollongbar Associate (531)
Banyule Silvermine 66th .	Jersey	28847	10-9-29	26-8-38	60	37	2.370	4·60	108·54	Sabina Vale Stud Farm	Milkmaid's Chief of Banyule (1412)
Sabina Vale Lotus .	do.	46111	16 1-32	1-8-38	90	26	2,400	4·40	106·17	Sabina Vale Stud Farm	Banyule Airo (5751)
Koojan Bluebell	Guernsey	1674	9-8-26	15 8-38	60	36	2,160	4·91	106·08	J. Rae	Robin of Nundorah (417)
Juadine Sparkle 7th ..	Jersey	44521	11-7-33	3-10-38	120	13·5	2,760	3·47	95·79	E. Loynel	Juadine Sunshine (8212)
Moorlands Genuine	do.	63180	2-11-32	2-4-38	180	6·5	1,658	5·63	93·27	E. Loynel	Melrose Clarion (6931)
Banyule Velveteen 12th ..	do.	24474	11-9-27	25-8-38	60	30·5	1,965	4·50	88·77	Sabina Vale Stud Farm	Wotton Airman (imp.) (2716)
Koojan Dolly	Guernsey	1254	18-6 25	20-7-38	90	30	2,400	3·67	88·02	J. Rae	Robin of Nundorah (417)
Sabina Vale Silvermine III.	Jersey	50540	25-5 33	1-9-38	60	28·5	1,740	4·80	86·52	Sabina Vale Stud Farm	Glen Iris Matilda's Lord (9481)
Moorlands Glee ..	do.	58545	22-8-32	2-5-38	90	7	936	6·05	56·63	E. Loynel	Melrose Clarion (6931)
Sabina Vale Pansy . .	do.	55176	23-11-32	7-10 38	30	32·5	975	5·35	52·50	Sabina Vale Stud Farm	Glen Iris Matilda's Lord (9491)
Summerlea Milkmaid XI. ...	A.I.S.	App. C.	6-9-32	8 5-38	30	41	1,230	3·71	45·66	Dunkley Bros.	Summerlea Searchlight (972)
Drakesbrook Janet	Guernsey	4144	2 11 32	24-5-38	30	14	420	4·46	18·72	J. Rae	Woodstock Emperor (2119)

BREEDING TABLES.

Time of Service.	Mares 340 days.	Cows 283 days.	Ewes 150 days.	Sows 112 days.	Bitches 63 days.
January 1	December 6	October 10	May 30	April 22	March 4
„ 8	„ 13	„ 17	June 6	„ 29	„ 11
„ 15	„ 20	„ 24	„ 13	May 6	„ 18
„ 22	„ 27	„ 31	„ 20	„ 13	„ 25
„ 29	January 3	November 7	„ 27	„ 20	April 1
February 5	„ 10	„ 14	July 4	„ 27	„ 8
„ 12	„ 17	„ 21	„ 11	June 3	„ 15
„ 19	„ 24	„ 28	„ 18	„ 10	„ 22
„ 26	„ 31	December 5	„ 25	„ 17	„ 29
March 5	February 7	„ 12	August 1	„ 24	May 6
„ 12	„ 14	„ 19	„ 8	July 1	„ 13
„ 19	„ 21	„ 26	„ 15	„ 8	„ 20
„ 26	„ 28	January 2	„ 22	„ 15	„ 27
April 2	March 7	„ 9	„ 29	„ 22	June 3
„ 9	„ 14	„ 16	September 5	„ 29	„ 10
„ 16	„ 21	„ 23	„ 12	August 5	„ 17
„ 23	„ 28	„ 30	„ 19	„ 12	„ 24
„ 30	April 4	February 6	„ 26	„ 19	July 1
May 7	„ 11	„ 13	October 3	„ 26	„ 8
„ 14	„ 18	„ 20	„ 10	September 2	„ 15
„ 21	„ 25	„ 27	„ 17	„ 9	„ 22
„ 28	May 2	March 6	„ 24	„ 16	„ 29
June 4	„ 9	„ 13	„ 31	„ 23	August 5
„ 11	„ 16	„ 20	November 7	„ 30	„ 12
„ 18	„ 23	„ 27	„ 14	October 7	„ 19
„ 25	„ 30	April 3	„ 21	„ 14	„ 26
July 2	June 6	„ 10	„ 28	„ 21	September 2
„ 9	„ 13	„ 17	December 5	„ 28	„ 9
„ 16	„ 20	„ 24	„ 12	November 4	„ 16
„ 23	„ 27	May 1	„ 19	„ 11	„ 23
„ 30	July 4	„ 8	„ 26	„ 18	„ 30
August 6	„ 11	„ 15	January 2	„ 25	October 7
„ 13	„ 18	„ 22	„ 9	December 2	„ 14
„ 20	„ 25	„ 29	„ 16	„ 9	„ 21
„ 27	August 1	June 5	„ 23	„ 16	„ 28
September 3	„ 8	„ 12	„ 30	„ 23	November 4
„ 10	„ 15	„ 19	February 6	„ 30	„ 11
„ 17	„ 22	„ 26	„ 13	January 6	„ 18
„ 24	„ 29	July 3	„ 20	„ 13	„ 25
October 1	September 5	„ 10	„ 27	„ 20	December 2
„ 8	„ 12	„ 17	March 6	„ 27	„ 9
„ 15	„ 19	„ 24	„ 13	February 3	„ 16
„ 22	„ 26	„ 31	„ 20	„ 10	„ 23
„ 29	October 3	August 7	„ 27	„ 17	„ 30
November 5	„ 10	„ 14	April 3	„ 24	January 6
„ 12	„ 17	„ 21	„ 10	March 3	„ 13
„ 19	„ 24	„ 28	„ 17	„ 10	„ 20
„ 26	„ 31	September 4	„ 24	„ 17	„ 27
December 3	November 7	„ 11	May 1	„ 24	February 3
„ 10	„ 14	„ 18	„ 8	„ 31	„ 10
„ 17	„ 21	„ 25	„ 15	April 7	„ 17
„ 24	„ 28	October 2	„ 22	„ 14	„ 24
„ 31	December 5	„ 9	„ 29	„ 21	March 3

WESTERN AUSTRALIAN EXPORT LAMBS, 1938.

F. L. SHIER and R. P. ROBERTS.

A study was made of the origins and quality of the lambs treated for export in Western Australia during the 1937 season and reported in a previous issue of this Journal.*

In the following paper a similar analysis is made of the lambs treated in 1938.

In Table I. are shown the numbers of lambs exported since the resumption of this trade in 1930, together with the average f.o.b. prices.

TABLE 1.

NUMBER OF LAMBS EXPORTED FROM WESTERN AUSTRALIA, 1930–1938, TOGETHER WITH AVERAGE PRICES PER HEAD.

Year.	No. of Carcases.	F.O.B. Value per Carcase (excluding Skin, By-products, etc.). s. d.
1930	22,826	...
1931	63,189	16 2
1932	10,527	13 10
1933	39,513	11 11
1934	113,454	17 5
1935	168,201	16 4
1936	143,949	17 0
1937	269,260	17 4
1938	363,645	17 6

The total of 363,645 exported in 1938 was the highest yet recorded, exceeding that of 1937 by approximately 95,000 or 35 per cent., and is indicative of the rapid expansion of the industry which is occurring in Western Australia.

During the 1938 season, 378,507 lambs, including approximately 3,000 which were graded as "summer" lambs and included in this study, were treated for export at the Robbs Jetty Works at Fremantle (338,188) and the Albany Freezing Works (40,319). Of this total it was possible to obtain the districts of origin and grading particulars for 315,477 lambs (275,158 from Robbs and 40,319 from Albany) which were forwarded direct from the country to the export works. In addition to these, information concerning only the district of origin was obtainable for a further 56,245 which were forwarded to the works at Robbs Jetty by exporters from the Midland Junction markets, but as they lost their geographical identity when passing through the sale yards, the available grading particulars were of no value for this survey. No information regarding either district of origin or grading was available for the balance (6,785) (1.9 per cent.). It was, therefore, possible to obtain districts of origin for 371-722 lambs treated out of a total of 378,507 (98 per cent.), and grading particulars of 315,477 (83 per cent.).

The distribution of the 378,507 is shown diagramatically in Figure 1 Figure 2 is a key map of the south-west portion of Western Australia showing the statistical districts, railways and the seven main subdivisions of the agricultural districts (heavy broken line) made for the purposes of these analyses.

All the lamb producing areas to the east of the 15in. rainfall line are grouped together and referred to as the Eastern districts. To the west of this line Mingenew and other road board districts northwards are referred to as the Northern districts. Three Springs, Carnamah, Moora, Dandarragan and the northern portion of Victoria Plains constitute the Midlands. The Central district includes Gingin, Chittering, Swan, Toodyay, Northam, York, Beverley, Brookton and those parts of

*Journal of the Department of Agriculture of Western Australia, December, 1938, pages 474-487.

Goomalling, Meckering and Quairading to the west of the 15in. isohyet. The South-West consists of all road board districts to the west of the 25in. rainfall line south of Perth and extending east as far as the east boundaries of the Upper Blackwood and Manjimup districts. The Great Southern district lies between the 15in. and

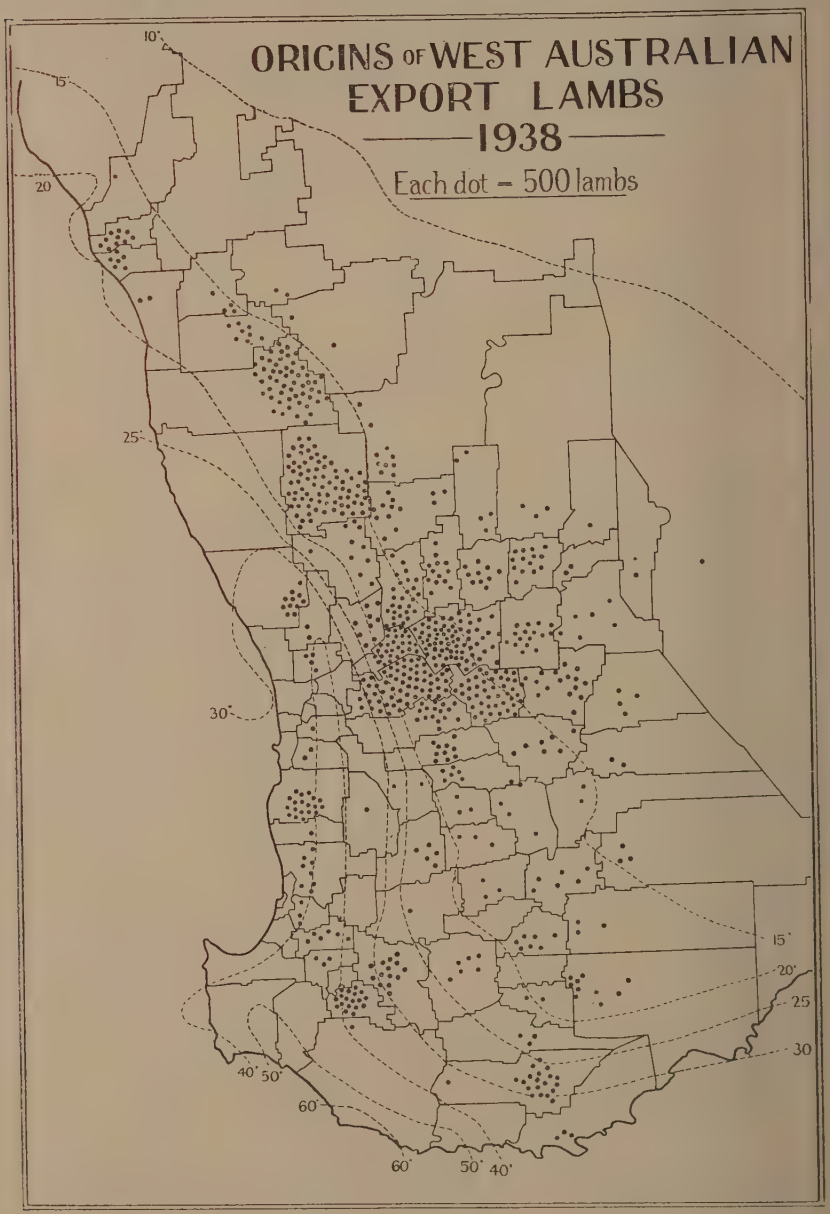


Fig. 1.

25in. rainfall line south of Brookton and Quairading and north of Katanning and Kent. The Kojonup, Cranbrook, Plantagenet, Denmark, Albany, Gnowangerup, Tambellup, Broomehill, Katanning and Kent districts constitute the Lower Great Southern.

The number of lambs from each of these subdivisions is shown in Table 2 in comparison with the figures for 1937.

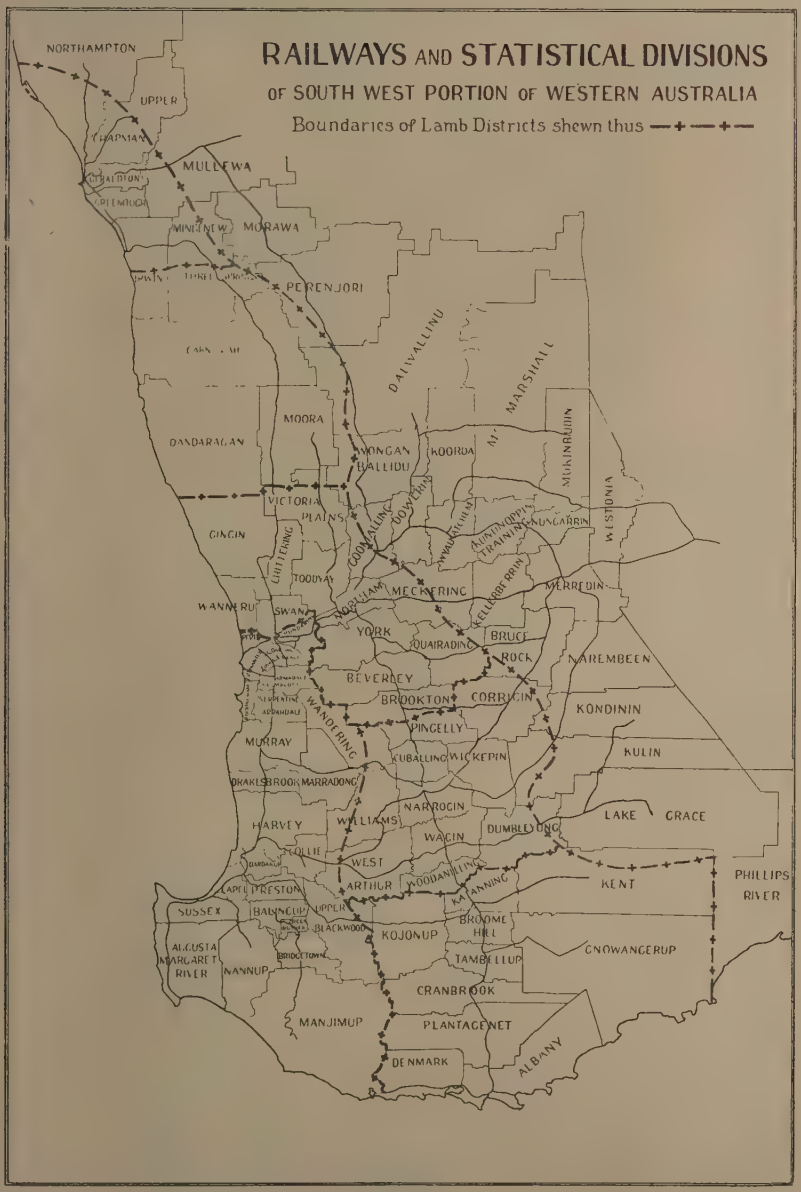


Fig. 2.

TABLE 2.

PERCENTAGE CONTRIBUTION OF DISTRICTS FOR 1937 AND 1938.

	Lambs for which complete grading information available.		Lambs for which only partial information available.		Total Lambs Treated.				Increase or decrease for 1938.
	1937 (209,357).	1938 (315,477).	1937 (69,579).	1938 (56,245).	1937.		1938.		
	%	%	%	%	%	No.	%	No.	%
Northern	3	3	2	1	3	8,180*	3	11,428	+40
Midlands	22	20	11	10	19	53,218	19	69,245	+ 30
Central	34	34	45	40	37	102,404	35	128,442	+ 25
Eastern	11	17	32	40	16	45,327	20	75,537	+ 67
South-West	18	12	3	3	15	41,024	11	39,504	— 4
Great Southern	5	5	6	5	5	14,137	5	19,855	+40
Lower Great Southern	7	9	1	1	5	14,646	7	27,711	+ 9
	100	100	100	100	100	278,936	100	371,722	+33

* Incorrectly reported as 5,207 in previous paper.

The chief feature of the table is the increased percentage of lambs from the Eastern districts. The figures for this subdivision showed a 67 per cent. increase over those of the previous year and the contribution to the State's total rose from 16 per cent. to 20 per cent. Lambs from the South-West, on the other hand, decreased slightly in numbers, and the percentage contribution to the total declined from 15 to 11 per cent.

The yearly grading figures for the State are given in Table 3 and in Table 4 the grading particulars for 1937 and 1938 according to the district of origin of the lambs.

TABLE 3.

GRADING OF WEST AUSTRALIAN EXPORT LAMBS, 1930–38.

Year.	Firsts.	Seconds.	Thirds.	Rejects.
1930	33·0	36·7	20·0	10·3
1931	34·5	44·4	18·0	3·1
1932	51·7	26·3	17·6	4·4
1933	37·8	22·1	37·2	2·9
1934	51.8	24.6	21.1	2.5
1935	38.3	38.4	21.5	1.8
1936	26.9	38.9	30.9	3.3
1937	32.0	37.2	27.7	3.1
1938	36.9	32.4	26.8	3.9

TABLE 4.

GRADINGS OF WESTERN AUSTRALIAN EXPORT LAMBS ACCORDING TO DISTRICT OF ORIGIN, 1937 AND 1938.

District.	Firsts.		Seconds.		Thirds.		Rejects.	
	1937.	1938.	1937.	1938.	1937.	1938.	1937.	1938.
Northern	17.9	21.5	41.4	33.7	36.8	38.1	3.9	6.7
Midlands	40.5	45.1	33.2	29.1	23.8	22.2	2.5	3.6
Central	28.7	43.2	37.7	31.3	30.7	22.4	2.9	3.1
Eastern	27.3	35.6	38.7	32.0	30.2	27.3	3.8	5.1
South-West	49.2	43.5	32.9	29.1	15.1	24.5	2.8	2.9
Great Southern	34.3	27.6	38.4	38.1	23.3	30.4	4.0	3.9
Lower Great Southern ...	54.4	22.1	34.9	40.9	8.8	32.1	1.9	4.9
State	32.0	36.9	37.2	32.4	27.7	26.8	3.1	3.9

The grading returns are largely a reflection of the seasonal conditions. The improved figures for 1938 as compared with 1937 are mainly due to the better incidence of the seasonal rains (although much below normal), resulting in improved pasture growth in the Central district, whose contribution of 35 per cent. of the total lambs treated had 43.2 per cent. first-grade carcases compared with 28.7 per cent. in 1937.

In the Lower Great Southern district there was a marked fall in the grading, the percentage of first-grade dropping from 54.4 in 1937 to 22.1 in 1938. This fall was probably influenced to a large extent by the system of buying that operated in 1938 whereby prices were offered for lambs delivered by a certain date. This encouraged early delivery, frequently before the lambs had attained a satisfactory "finish." The bulk of the rejects at Albany, for example, were for "below export

TABLE 5.

CONTRIBUTIONS OF DISTRICTS TO LAMBS RECEIVED AT WORKS DURING HALF-MONTHLY PERIODS, 1938.

Subdivision.	Per cent. for—										
	1st–15th July.	16th–31st July.	1st–15th August.	16th–31st August.	1st–15th September.	16th–30th September.	1st–15th October.	16th–31st October.	1st–15th November.	16th–30th November.	1st–15th December.
Northern	...	...	...	1	5	6	3	3	2	1	...
Midlands	63	57	49	36	29	25	18	9	...	1	6
Central	17	37	27	38	35	36	34	37	32	10	...
Eastern	...	6	18	21	18	18	19	18	11	...	...
South-West	...	...	...	...	2	2	15	17	32	52	44
Great Southern ...	...	...	4	2	4	6	5	6	8	3	2
Lower Great Southern	20	...	2	2	7	7	6	10	15	33	48
Total (per cent.) ...	100	100	100	100	100	100	100	100	100	100	100
Total (No.) (315,477)	512	2,525	6,676	24,284	40,301	87,462	67,336	48,372	20,053	15,796	2,160

standard." In general, the better prices offered for the early lambs have encouraged early mating in these areas resulting in lambs being produced during the cold, wet months and before the usual flush of feed. Whether this is the best practice is an involved question and not suitable for discussion in this paper, but it is felt that mating in these districts should be later than it is at present. This would ensure better grading figures over a period of years.

Although production is small and the industry is as yet in its infancy in the Northern district, the grading returns for 1938 were again decidedly below the average. Poor seasonal conditions were undoubtedly the main cause.

In the other districts there were only slight differences between the returns for the two years.

The manner in which each district contributed to the total lambs treated in the half-monthly periods throughout the killing season is indicated in Table 5.

In the accompanying series of graphs (Figures 3 to 9) are shown for each district:—

(1) The total numbers of lambs received for export at the freezing works during the half-monthly periods (in solid black), and

(2) The percentage grading for each of these periods (hachuring).

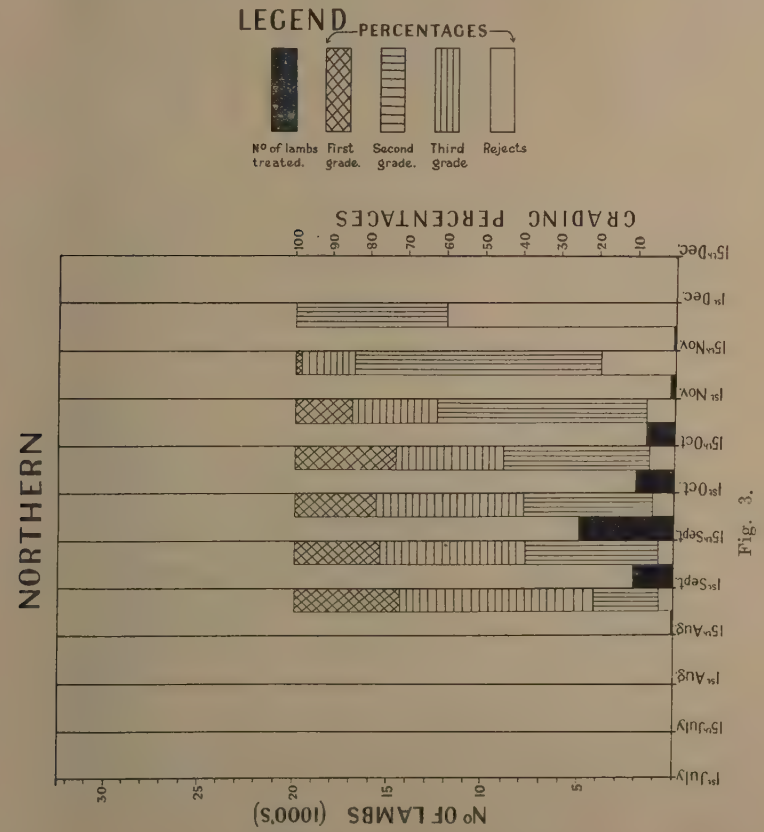


Fig. 3.

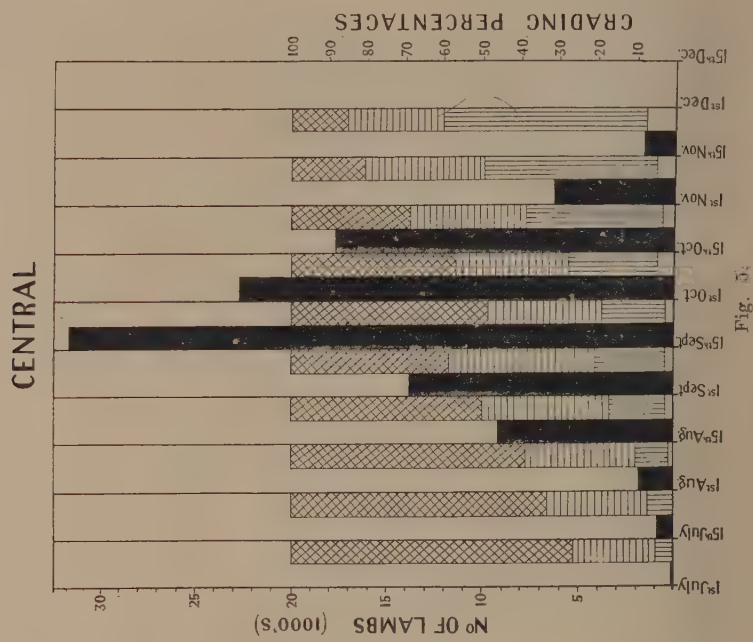

CENTRAL
No OF LAMBS (1000's)
GRADING PERCENTAGES
1st July
15th July
1st Aug.
15th Aug.
1st Sept.
15th Sept.
1st Oct.
15th Oct.
1st Nov.
15th Nov.
1st Dec.
15th Dec.

Fig. 3.

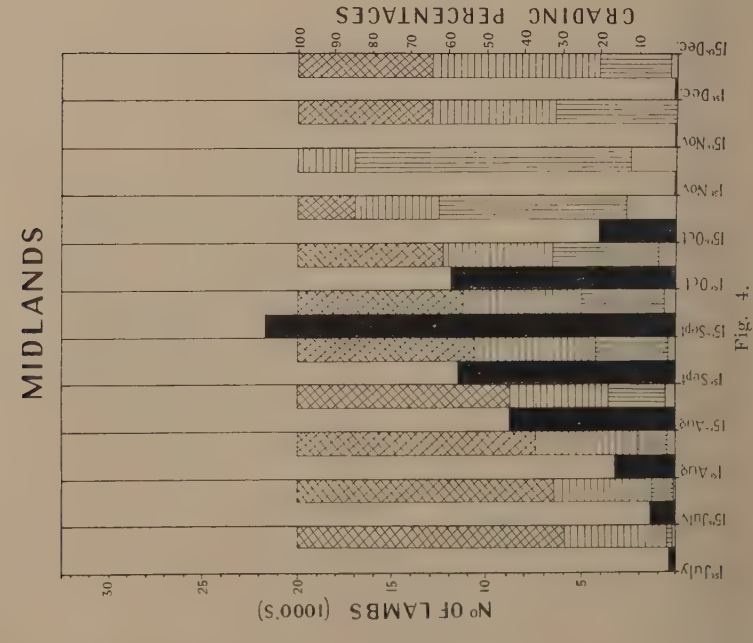

MIDLANDS
No OF LAMBS (1000's)
GRADING PERCENTAGES
1st July
15th July
1st Aug.
15th Aug.
1st Sept.
15th Sept.
1st Oct.
15th Oct.
1st Nov.
15th Nov.
1st Dec.
15th Dec.

Fig. 4.

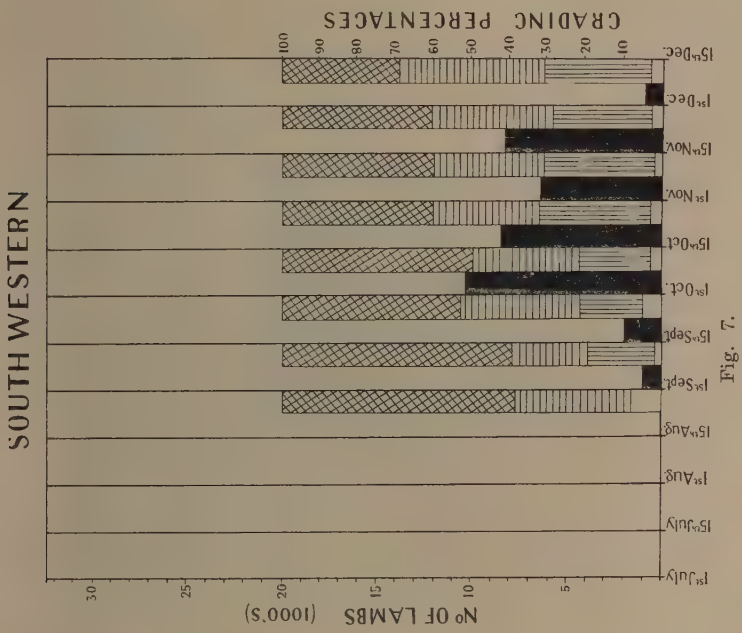

SOUTH WESTERN
CRADING PERCENTAGES
100 90 80 70 60 50 40 30 20 10
15th Dec.
1st Dec.
15th Nov.
1st Nov.
15th Oct.
1st Oct.
15th Sept.
1st Sept.
15th Aug.
1st Aug.
15th July
1st July
No OF LAMBS (1000's)
30 25 20 15 10 5

Fig. 7.

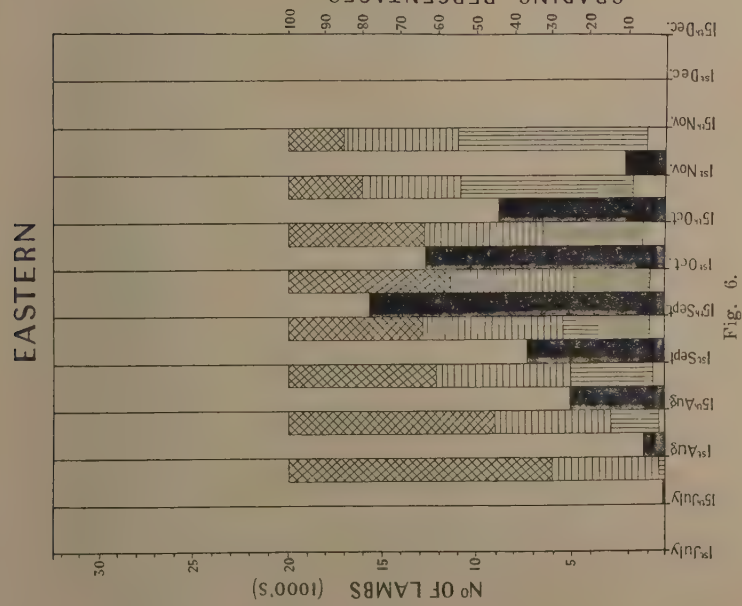

EASTERN
CRADING PERCENTAGES
100 90 80 70 60 50 40 30 20 10
15th Dec.
1st Dec.
15th Nov.
1st Nov.
15th Oct.
1st Oct.
15th Sept.
1st Sept.
15th Aug.
1st Aug.
15th July
1st July
No OF LAMBS (1000's)
30 25 20 15 10 5

Fig. 6.

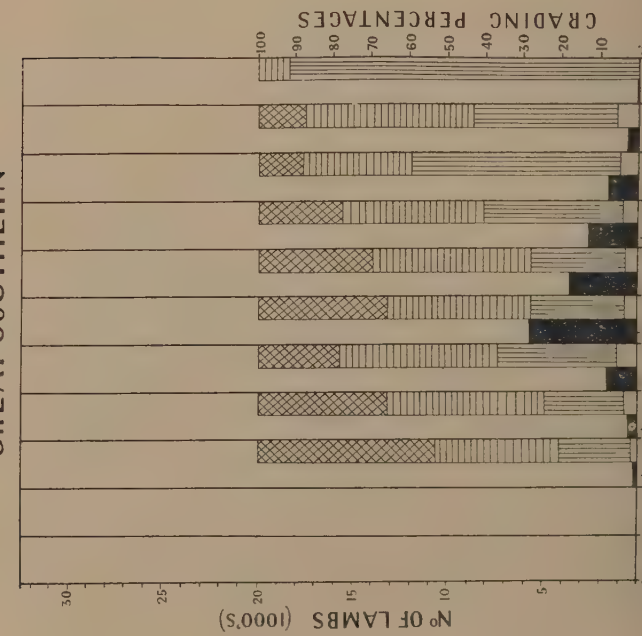

GREAT SOUTHERN
No OF LAMBS (1000's)
CRADING PERCENTAGES
1st July
15th July
1st Aug.
15th Aug.
1st Sept.
15th Sept.
1st Oct.
15th Oct.
1st Nov.
15th Nov.
1st Dec.
15th Dec.

Fig. 8.

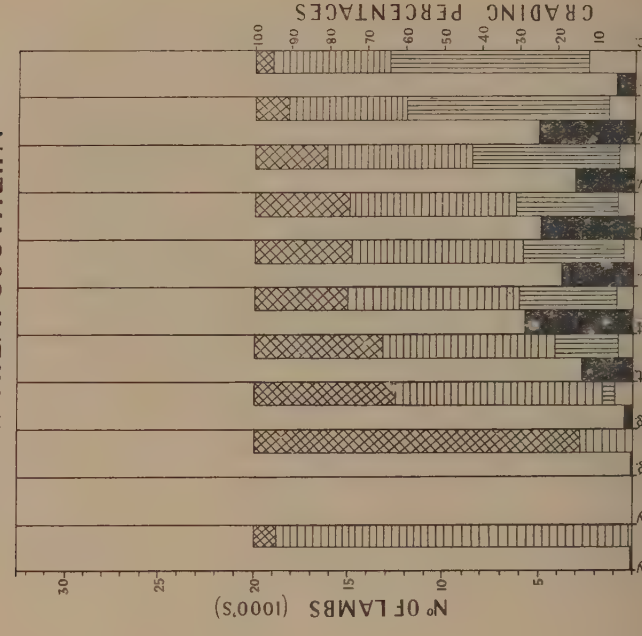

LOWER GREAT SOUTHERN
No OF LAMBS (1000's)
CRADING PERCENTAGES
1st July
15th July
1st Aug.
15th Aug.
1st Sept.
15th Sept.
1st Oct.
15th Oct.
1st Nov.
15th Nov.
1st Dec.
15th Dec.

Fig. 9.

In Figure 10 the percentage grading for half-monthly periods for the whole State is graphically represented.

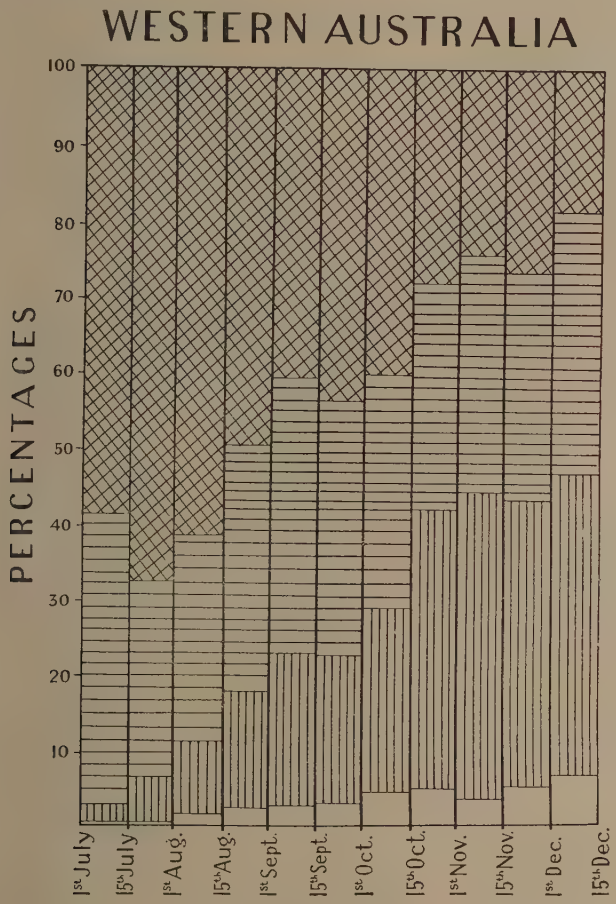


Fig. 10.

For the sake of simplicity, the total numbers treated in half-monthly periods are not included in this graph, but are to be found in Table 5. In this graph the chief feature is the steady decline of first-grade lambs as the season advances, and the corresponding increase in third-grade carcases, together with some increase in the number of rejects.

The authors again acknowledge their indebtedness to the various firms who made available the information upon which this analysis was based. They are particularly grateful to officers of the W.A. Meat Export Company and the Albany Freezing Works, without whose assistance in the shape of tabulated information concerning the grading of many hundreds of consignments of lambs, this study could not have been made.

AGRICULTURAL PROBLEMS.

Agriculturists, pastoralists and primary producers generally, who may be having difficulties of any kind in connection with their production activities, are invited to communicate with the Agricultural Adviser of their district of the Department of Agriculture, when information and advice will be supplied free of charge.

Where identification of plant or stock diseases or insect pests is required, full details of symptoms should be forwarded and also samples of the diseased plant, animal tissue or insect where practicable. Plant tissue intended for examination by the Plant Pathologist should be wrapped in paper and not forwarded in airtight containers, and plant specimens for the Botanist should be pressed between newspaper and dried before despatch. With regard to animal tissue for microscopic examination, this should be forwarded in a solution of 10 per cent. formalin, or if of considerable bulk in a sealed kerosene tin containing a few ounces of formalin as a preservative. Living insects should be sent in suitable containers and dead specimens in methylated spirits.

The addresses and names of Advisers are as follows:—

Albany	H. R. Powell (Fruit); B. Williams (Dairying).
Bridgetown	A. Flintoff (Fruit); A. M. Tindale (Dairying).
Bunbury	M. Cullity.
Busselton	J. M. Nelson.
Geraldton	N. Davenport (Government Buildings).
Gosnells	R. C. Owen.
Harvey	R. L. Cailes (Fruit).
Katanning	A. S. Wild.
Kalamunda-Roleystone	W. H. Read, c/o. Department of Agriculture, Perth.
Kununoppin	W. M. Nunn.
Manjimup	C. M. Scott.
Metropolitan, Gingin, Chittering ...	S. E. Bennett, c/o. Department of Agriculture, Perth.
Mundaring	V. Cahill.
Narrogin	A. T. Gulvin.

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No. 38.—*Linseed or Flax and Its Cultivation.* Geo. L. Sutton.
No. 46.—*Fruit Packing and Marketing and Exporting of Fruit.* J. F. Moody and J. Ramage. Price 1s. 6d.
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No. 60.—*The Farmer's Clip.* J. J. Mahood.
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